AMERICAN GAS ASSOCIATION MONTHLY

Laboratory Studies of the Performance of Pipe Coatings

Appliance Testing and Laboratory Operation

The Gas Industry Today

Effective Venting of Gas Heating Equipment

Cost of Water Heating By Furnace Coils

1934 Distribution Conference To Stress Economy and Service

March 1934

VOL. 16 NO. 3

Approved and Adopted . . . .

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Tells Newspaper Publishers of Natural Gas Problems

ADDRESSING the Pennsylvania Newspaper Publishers Association, in Philadelphia, February 3, J. French Robinson, of Pittsburgh, vice-president of the Peoples Natural Gas Company and the Columbia Natural Gas Company, pointed out four phases of the natural gas business which are frequently discussed and criticised by the public and by the newspapers—rates, vested or exclusive rights, advertising and retail merchandising, and taxes and excessive profits.

Mr. Robinson covered these topics in terms of their application to the newspaper publishing business as well as to the utility business.

On the subject of advertising and retail merchandising, he said:

"With competition for the consumer's dollar increasing, it is safe to state that distribution is, today, an outstanding factor in most business enterprises. From the very necessity of the case, all business must focus its activities upon finding a market for its product. Here is the source of its income. Toward it, every effort must be turned if the business is to earn a profit and keep going. I think it imperative that the natural gas industry increase its advertising, and make every effort possible to increase its sales; just as it is imperative that your organization increase its volume of advertising and the number of your newspaper sales in order to hold this advertising.

"I believe the natural gas industry should be criticised for doing too little advertising rather than for doing too much. We have been too ready to assume that the public knew all about the efficiency, cleanliness and other merits of natural gas. As a result, we may have lost to competition much more of our business than we should have lost.

"The natural gas industry has been criticised for advertising and for selling gas appliances. Some of our critics have stated that we should not compete with retail merchants and should utilize in rate reduction that which we spend in advertising. I am sure I do not have to apologize to this audience for advertising a worthy product, nor need to tell you that intelligent advertising tends to reduce rather than increase a selling price.

"On the question of retail merchandising, the only answer to that is that we must take the lead if it is to be done at all. Our continued existence depends upon keeping present consumers on our lines and adding new ones.

"Appliances must be sold to replace obsolete models and to make possible new uses of natural gas, such as today's refrigerator and tomorrow's air conditioning system.

"It is imperative that we see that our customers have the most up-to-date and efficient appliances, for the value of gas service is judged by appliance efficiency.

"A gas company has a sustained responsibility to a consumer to whom it sells appliances, for the company is especially anxious to see that these appliances are efficient. If they are not, the company stands to lose a gas consumer to a competitive fuel. Your gas company not only has a responsibility of service but of safety.

"We are compelled to meet all forms of competition on the articles above mentioned which are backed by the most extensive program of advertising. Independent merchants cannot be expected to sell only natural gas appliances. Merchants are just as willing to sell coal furnaces as they are to sell gas furnaces and just as willing to sell electric refrigerators as gas refrigerators. They are sensible enough to carry what the customer wants. It is up to us to make the customer want gas appliances.

"It seems to me that an impartial and unprejudiced analysis of this question would suggest that the public interest would be far better served by legislation compelling utilities to merchandise tested appliances as a guarantee of satisfactory consumer service and safety, rather than to prohibit them from merchandising."

AMERICAN GAS ASSOCIATION MONTHLY

Allyn B. Tunis, Editor

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The Gas Industry Today*

H. O. Caster

By H. O. Caster

President, American Gas Association

THE gas industry is beset with many perplexing problems:

(a) It is engaged almost solely in intrastate commerce. Its rates and service are controlled by state laws and state commissions.

(b) It is now asked by the Federal government to file a code and subject itself to the National Industrial Recovery Act, which governs to a great degree its hours of labor and wages.

(c) It is plagued by the common belief that utilities generally are receiving more for their services than they are entitled to receive, and that they have not been willing to go along and bear their share of the depression.

(d) Its ability to collect from its customers has been greatly affected by the depression. Many people who are unable to pay have been carried along, and substantial losses will thus be occasioned to all companies.

Nevertheless, the industry has gone along and furnished substantially perfect service constantly, at reasonable rates. None of us are making more money than we are entitled to make, and many of us not as much.

Because of the present state of the public mind, we are all beset with problems which we hardly know how to solve and perplexing questions which are difficult to answer. But I am sure that we all feel that we should carry on as in the past, with full confidence that public opinion will do us justice in the end.

Present State of Mind of American Public

The American people are very much confused by the New Deal. Public opinion seems to be divided into two classes. One class is sure that the foundations of our civilization are being swept away; that our Constitution has become a mere scrap of paper, and that we are headed toward disaster. The other class thinks we are just entering the millennium.

The attachment to our institutions of government is so great that the wide divergence from them which has so suddenly been made leaves many of our citizens confused. There have been so many commissions and bureaus created, with legislative or semi-legislative and quasi-judicial powers, that laws have given away, to a considerable extent, to the opinions of the men who comprise the personnel of these commissions and bureaus. This is true in our state governments as well as in our federal government.

Even the courts have been affected, in some ways, by this state of public opinion, and their decisions have placed strained construction upon our Constitution and laws.

Our institutions and laws are largely Anglo-Saxon in their origin. When that race came up out of the woods into civilization, something over two thousand years ago, it brought with it certain characteristics and traditions which have followed it, in both England and America, in the development of our laws and institutions. There was, for instance, the love of personal liberty. Our earliest historical information illustrates this. If the king desired to go to war with some other tribe or nation, the chieftains were called into a meeting, which may have been held in the king's wood, to determine the question. If the warriors were in favor of fighting the proposed war, when the proposition was put to them they clashed their spears and shields together to show their assent;

(Continued on page 95)

*Digest of Address delivered before New England Gas Association, Boston, Mass., Feb. 8, 1934.

Appliance Testing And Laboratory Operations*

By R. M. Conner

Director, A. G. A. Testing Laboratory

A REVIEW of available statistics indicates that the first definite steps leading to the establishment of a national agency for the testing and certification of domestic gas appliances were taken by the gas industry in 1915. In that year a committee headed by R. B. Harper, now vice-president of The Peoples Gas Light & Coke Company, Chicago, made definite recommendations and presented plans for placing such a program into effect. Several years before this, Wm. J. Serrill, of the United Gas Improvement Company, and others had also been deeply interested in the promotion of similar plans.

Actual credit, however, for conclusion of final arrangements must go to a group headed by H. C. Abell, former president of the American Gas Association, which was assigned to this duty during the administration of Past-President J. B. Klumpp. Other leaders active in the preparation of final plans were Col. Oscar H. Fogg, N. T. Sellman, at that time connected with the Association's staff, and the late A. H. Hall, vice-president and general manager of the Central Union Gas Company. There were numerous others, of course, outside our Association's own staff who played a most important part in the foundation of our institution, among whom must be mentioned are E. R. Weaver, chemist of the United States Bureau of Standards, and R. W. Gallagher, former president of the American Gas Association and the first chairman of the Laboratory Managing Committee.

Perhaps it would first be best to discuss briefly the main reasons for the inauguration of our Association's testing program. Undoubtedly the principal item was that of safety, although there were naturally many other important considerations. "Safety" is a rather all-inclusive term as used by our industry and covers practically every safety aspect connected with the utilization of gas. It may be interpreted as ranging all the way from requirements designed to prevent the housewife from cutting her hands on the oven linings of a gas range, to safeguarding her from fire hazards, explosions, or breathing air containing products of incomplete combustion. Besides these factors our organization has also been particularly active during the past three years in promoting a program that would insure the gas-consuming public convenient, durable and efficient appliances.

Half-Million Dollars Invested

Cleveland Laboratory property and equipment is owned entirely by the American Gas Association. The Los Angeles Branch is housed in a rented building, although a very favorable long-term lease has been secured there with an option for its renewal. All of the testing apparatus at this branch is also owned by the A. G. A. The total investment represented by both enterprises is in the neighborhood of a half million dollars, approximately $125,000 of which was advanced initially by a number of our larger member gas companies. Other necessary funds have been supplied by our Association.

The Laboratory's policies are shaped by two main committees—the Approval Requirements, and Laboratory Managing Committees. The functions of each of these groups expressed in their order might be termed broadly legislative and administrative; in other words, the first mentioned group supervises the preparation of our test standards, and the second provides rules and affords means for placing them into effect. Undoubtedly it is known that our Approval Requirements Committee contains representatives from all interested governmental bureaus, trade associations and scientific organizations directly or indirectly interested in the gas business, and also that it is a sectional committee of the American Standards Association. Through this last mentioned connection we are assured acceptance of our requirements from the highest authority on standardization matters in the land.

Mr. Harper is chairman of our Approval Requirements Committee and J. S. DeHart, Jr., chairman of the Managing Group. Both of these men have long been prominent in Association affairs. Without a doubt, a very great portion of the Laboratory's success can be attributed to the able guidance of these two men who have for so many years given generously of their time and efforts to the betterment of our industry's affairs.

It seems appropriate at this time to mention also other agencies that have been highly instrumental in contributing to the Laboratory's progress. In the first place, our establishment could never have succeeded without the wholehearted cooperation of the most of our gas appliance manufacturers. Second, we have always needed and received the most loyal support from the great majority of our member gas

* Address delivered before the Society of Gas Lighting, New York, N. Y., Feb. 15, 1934.

View of Industrial Gas Research Section

companies. An example of the way in which our institution is regarded by the leaders of our industry is perhaps best illustrated by the following extract lifted from an address of our former president, Clifford E. Paige:

"The American Gas Association had to establish a Laboratory to assure the sale of safe, economical, and satisfactory equipment. Before appliances were built to such exact standards as now exist, gas-using equipment was of a bargain counter nature and the merchant interested only in merchandise turnover lost his interest on delivery of the appliance. Complaints as to its operation were usually interpreted as due to poor gas or poor service supplied by the gas company."

From the beginning it was felt that certification tests made by our organization should be of such a nature that they would insure safe and satisfactory performance on any kind of city gas, regardless of where the appliance was installed. Obviously, this requirement calls for a high degree of flexibility in performance, which is desirable under any conditions of service and certainly in this period of rapidly changing gas supplies. To insure this class of performance, it was thought necessary to determine accurately the limits of gas quality encountered throughout the United States and Canada and then to select for our test gases those that would adequately represent such limits. It was assumed in the beginning, and later proven to be a fact, that any appliance which would perform satisfactorily on these test gases under service conditions would operate even more successfully on any gases encountered between these respective limits. In securing such information it was necessary to duplicate the gas conditions prevailing in practically every large city in the United States and Canada.

Emphasis Placed on Safety

It is not intended to discuss here in great detail how our approval tests are made. Rather, it is hoped to point out in a general way why they are made and to dwell at greater length on the improvements which have been effected as a result of their application. We can probably sum up the object of our testing program sufficiently accurately by saying that it is designed to insure the gas-consuming public an adequate supply of safe and reasonably durable and efficient appliances. Certainly emphasis has always been placed on safety—and it should be. No compromise has ever been made on this point nor probably ever will be. As far as durability is concerned, it was felt that the desired goal could best be attained by initially requiring at least that degree of durability which is inseparable from safety, and by instituting from time to time requirements that would necessitate a gradual process of improvement leading to such an end.

Spectral Line Reversal Apparatus Used for Measuring High Gas Temperatures

From time to time proposals have been made that a system of classifying approved appliances according to quality be inaugurated. Such a plan, incidentally, is the rock upon which a number of very worthwhile proposed testing projects have foundered. The electrical industry today would probably be enforcing a program similar to our own were it not for the desire of some to incorporate in such a plan a rating system intended to favor superior types of appliances, upon which, of course, interested manufacturers were utterly unable to agree.

It seems to me that any such plan which, in effect, attempts to establish the superiority of one manufacturer's products over another is doomed to eventual failure. In the first place, manufacturers receiving the lower ratings would unquestionably claim, and with probably some justification too, that they had been discriminated against. Such claims might even be made the basis of court actions, and suits of this nature might be pressed with a fair measure of success. Further than these points, it is also very doubtful if any committee or group could ever agree on such rating systems, and in the last analysis such a plan would probably fail to accomplish the desired end, largely for the reason that most manufacturers probably would never support it.

Startling Improvements Made in Three Years

It is very difficult, if not actually impossible, to present an accurate picture of the improvements in the performance of gas appliances which have resulted from the application of our testing program. It is safe to say, however, that very few people realize the extent to which such activities have been responsible for the development of new appliances. While our staff does not actually inform the manufacturer how to design and construct his appliances, our initial test data discloses countless defects which are corrected by the manufacturers during the process of securing their approvals. Actual test records indicate that 99.8 per cent of all the appliances submitted for test must be corrected in one form or another before they are finally approved.

More startling improvements have been made in domestic gas appliances

View of Chemical Section at A.G.A. Testing Laboratory showing Iodine Pentoxide Apparatus used for determining concentrations of carbon monoxide in flue gas samples from gas appliances

in the last three years than were made in the previous fifteen. It seems safe to conclude that if the Laboratory had not been in operation during this time, the service difficulties encountered following the introduction of so many new types of appliances would have been tremendous. Therefore, we appear to be perfectly safe in assuming that marked improvement in the performance of domestic gas appliances has been effected throughout the entire period of the Laboratory's existence.

In view of the fact that our testing program was established largely in the interest of safety, it is interesting to study the progress that has been made in safeguarding our customers in such fields. It will be understood, I am sure, that reliable information on accidental asphyxiations is very meager and of a most indefinite nature. A study of statistics of this kind concerning two of our larger cities, namely New York and Baltimore, is extremely interesting. Taking New York City, for example, it is found that accidental asphyxiations have declined steadily since 1926. As for Baltimore, the Health Department records there indicate that asphyxiations attributable to defective appliances decreased 33⅓ per cent from 1930 to 1933, the former date being shortly after the enactment of a gas ordinance which became effective on the majority of domestic appliances at that time.

The Director of the Bureau of Environmental Hygiene, in commenting on these records, attributed this decrease in accidental asphyxiations largely to the enforcement of the gas ordinance. Considering this subject from an even broader standpoint, we find that the United States Bureau of Census statistics indicate that from January 1, 1928, to the first of 1932, the average accidental death rate per 100,000 population over each of these four years, from all kinds of poisonous gases, declined 19.2 per cent, or roughly, 5 per cent per annum. Apparently the use of gas is being made much safer, and while it would not be correct to attribute this entire improvement to city gas and our testing program, the Baltimore statistics alone definitely show that the Laboratory's efforts are certainly responsible for a portion of it.

It would be rather difficult, on account of changing policies, and the fact that there are so many intangible considerations involved, to arrive at any accurate statistics on the number of service complaints assignable to approved appliances in contrast to unapproved types. The fact that modern appliances are so much more complicated than former types from a mechanical standpoint would also tend to make any direct comparisons of this nature of doubtful value. Conversation which the author had with the president of a large space heater concern seems to illustrate this point very well.

It so happened that the organization involved began production of its heaters after the Laboratory began operations. Consequently, all of the products concerned were thoroughly tested and many changes made in the original samples to bring them into accord with all of our requirements. After approximately 30,000 of these space heaters had been installed, the executive mentioned made the statement that outside of a very few replacements of broken elements, his organization had never had any trouble with its appliances after they were installed. This example might very well be contrasted with the experience of an even larger producer of radiant heaters who installed thousands of them before the Laboratory began operations and on which it is known there were literally thousands of service complaints.

23,000 Appliances Approved

Although it is admittedly not possible to present at this time accurate figures which will show the exact extent of improvements in appliance performance brought about by the Laboratory's operations, it is known in a general way that great strides have been made and that our customers have profited accordingly. Considering the extensive and radical changes that have been effected in the design and construction of gas ranges, especially in the last few years, we can only conclude that our industry has been extremely fortunate to have an impartially operated and well-equipped institution for insuring satisfactory appliances and to which the equipment manufacturer might turn for assistance during a very trying period.

Since our establishment began operations late in 1925, more than 7,500 domestic gas appliances have actually been tested and approval has been extended to more than 23,000 models as a result of such tests. Revenue derived from testing and inspection activities up to January 1, 1934, totaled $878,965.55. These figures are mentioned primarily to indicate the extent to which our institution has become a part of our industry's business life.

It is believed that the only reference necessary here to our appliance inspection program is a statement of the fact that inspections are carried on annually and that they are being made more exacting from year to year. An interesting point in this connection also is the fact that fewer manufacturers were removed from our List of Approved Gas Appliances on January 1st last than ever before in the Laboratory's history, indicating the apparent value of our approval and its increasing popularity.

It is extremely gratifying to report that despite the very unfavorable business conditions which have prevailed throughout the past four years, research activities at our institution have been carried on aggressively during this period. It is not intended to discuss even our most important research problems, as all of them have been thoroughly covered in Association reports which have been widely distributed. Rather, it is hoped to point out the need for additional research and to touch somewhat on its value. It might be pointed out in passing that some of our research studies have been confined to problems in the production and distribution field, although they have been centered largely in what is generally regarded as being the utilization field. Industrial uses of gas are also receiving a particularly large amount of attention from our research staff at the present time. Such studies are not confined to appliances, but rather to the development of basic knowledge on the use of our product, particularly in high temperature applications. Moreover, all of our approval requirements subcommittees which are engaged in the preparation of test standards, are continually assigning research problems to the Laboratory. The number of such special studies would probably average about 100 when computed from year to year. These latter investigations have a marked effect on the design of new appliances and are not only of tremendous importance to the success of our whole testing program, but are of exceedingly great value to our member manufacturers.

Scientific Problems Involved

It is general knowledge that almost every worthwhile achievement marking the progress of mankind has been the direct or indirect result of some scientific investigational work. Not all of such activities have been carried out in a laboratory, largely for the reason that such facilities did not always exist. It seems safe to predict, however, that as our everyday life grows more complicated, a greater portion of important discoveries of this nature will originate from enterprises where adequate facilities for experimental work exist. Just as it is becoming increasingly difficult for untrained men to start at the bottom and work their way up to a position of prominence in the technical field of any business, so will it become more difficult as the years pass for industries that are not fortified by an adequate background of fundamental research to increase their business, or even maintain their existence.

View of some of the hotel ranges under investigation for the A.G.A. Committee on Industrial Gas Research

Conduct of our business involves a great many problems that are scientific in the extreme. It has been said that the electrical industry is the most highly complicated from an engineering standpoint that exists today. This is very doubtful, and it is believed that if our business is developed to the point where it should be, we will find that it requires knowledge delving into every branch of the engineering profession. Even in our small Laboratory organization we require chemical engineers, chemists, physicists, civil engineers, mechanical engineers, and in fact, an intimate knowledge of every branch of the engineering profession, to solve the many problems which are assigned to us.

Undoubtedly, everyone in your organization believes not only in the importance of a properly planned and adequately financed research program being carried on by our industry, but is probably willing to concede its absolute necessity. Consequently, it seems that we might now with profit consider the possibilities of such activities. The discovery in recent years of new fields of natural gas, and its transportation over great distances through high pressure transmission lines, has resulted in the distribution of large quantities of mixed gases. On account of the many variable factors involved in the production, distribution, and utilization of such products, numerous new problems have arisen which have been made the basis for a great deal of scientific investigational work. The mixed gas research carried on by F. C. Weber's committee was an outstanding example of this kind. This study, which extended over some five and one-half years, involved more than 250 different kinds of gases, employed some 175,000 separate tests, and has established gas mixing standards that will prove of increasing value to our industry through the years to come.

What are the more profitable fields for new business, and what are their potential possibilities? Apparently, there are no loads that we are now carrying that should not be continued, if not greatly increased. It seems extremely important that we maintain our present advantage in the domestic cooking and water heating fields for psychological reasons, if for no other. In addition to this, the cooking load has always been the backbone of our business and undoubtedly will prove so for many years. Great advancement can also be confidently expected in the house heating and air conditioning fields. In so far as our domestic load is concerned, it seems that this class of business offers wonderful opportunities for greatly increasing our send-out. It appears, however, that the greatest possibilities for obtaining large volume exist in the industrial fields. Our industrial gas research studies being carried out by Mr. Rutledge's committee and the thousands of different and profitable applications of gas

(Continued on page 96)

Gas Exhibit at Farm Show Ties in with A. G. A. Sales Promotion Work

By George L. Cullen

Sales Manager, The Harrisburg Gas Company

THIS exhibit, a cooperative one on the part of the Pennsylvania Gas Association and The Harrisburg Gas Company, was the first exhibit of any impressive size to clearly demonstrate the modern gas appliances. This outstanding attempt to place the modern gas industry before 300,000 visitors is one that will undoubtedly be of interest to the members of the Association and the gas industry, and ties in very well with the work of the National Directing Committee of Executives of the American Gas Association, of which Conrad N. Lauer, president, The Philadelphia Gas Works Company, is chairman."

In these few, well-chosen words, N. B. Bertolette, president, The Harrisburg Gas Company, told the story of the outstanding display of modern gas appliances at the Pennsylvania Farm Show, held in Harrisburg from January 15 to 19, inclusive. The show this year, at which the display of gas appliances was jointly sponsored by the Pennsylvania Gas Association and The Harrisburg Gas Company, was the fourth one to be held in the magnificent Pennsylvania Farm Show Building.

Records of all kinds were established. But first and foremost let us consider the record gas appliance display.

This exhibit was 110 feet long—eleven display booths—and was divided into five sections. The center section was devoted primarily to a "style show of gas ranges" under the single important spot word "leisure"—leisure being the result of using a modern automatic gas range. At the direct center of this section a projector threw a series of pictures on a ground glass describing the many features of the present-day improved gas range. The "movement" of the pictures attracted the attention of thousands, who remained to examine the appliances. The background against which the ranges were exhibited was neutral in shade, yet colorful, and each range was lighted from below and directly in front. The attractive finishes of the ranges were accentuated with the lighting and the neutral background. Trade names of the ranges strikingly lettered were placed above each appliance.

At each end of this "style show" was an Electrolux gas refrigerator, to complete the center section.

To the left of the "style show" was a section devoted to the display of other ranges and Electrolux refrigerators.

Realistic Display

A model gas-equipped kitchen, presided over by Elizabeth M. Heldt, home service director of the Harrisburg company, which would have made any housewife envious, occupied the left end section. Automatic gas range . . . . gleaming Electrolux gas refrigerator . . . . monel metal drains and tables . . . . all things that go to make the kitchen a room of which to be proud, were exhibited. And thousands looked with longing eyes at the display. Miss Heldt was kept busy showing and explaining her "domain."

To the right of the center section were displayed Clow gasteam radiators, fireplace heaters, gas refrigerators, gas water heaters—two of which were "cut out" to show insulation and construction—a gas conversion burner, and a warm air space heater.

The right end section showed what could be done with a basement "the gas way." A gas house heater, incinerator and a water heater were the appliances displayed, in front of which—and carrying out the theme of "an extra room in the basement" through the use of clean, effortless gas appliances—was a card table and chairs set for a bridge party.

Many of the appliances were connected, adding further realism to the display.

Above the exhibit was a large sign plainly, yet attractively lettered "Modern Gas Appliances for the Modern Home—The Pennsylvania Gas Association—The Harrisburg Gas Company." On many of the appliances were signs stressing the outstanding points of modern gas appliances and service.

Salesmen were on duty during the entire show, and for the first time since we started exhibiting direct sales were made. These included seven ranges, one automatic water heater and two refrigerators. In addition, more than 100 Class A prospects were secured.

H. S. Christman, sales manager, The Philadelphia Gas Works Company, was chairman of the Association committee on arrangements, and the display was designed by and erected under the supervision of L. C. Heiss, in charge of display work for the P. G. W. Company.

The entire display was used also at the Twenty-fourth Annual Automobile Show, held in the Farm Show Building from January 24 to 27, inclusive.

Our company advertising for a few weeks before and during the Farm Show featured "Go to the Farm Show—You Will See the Finest Collection of Modern Time-Saving and Labor-Saving Appliances Ever Assembled in a Single Exhibit." Circular letters were sent out by the Pennsylvania Gas Association which attracted a large number of gas men and women from all over the state.

New Records

Now for the other records:

Attendance passed 287,000; there were 1,800 exhibits; prizes totaled almost $40,000; the estimated business

(Continued on page 106)

Effective Venting Of Gas Heating Equipment

By Milton T. Clow
James B. Clow & Sons

SO that gas burning apparatus may function efficiently and provide truly automatic heat, every detail of the installation must be carefully designed. The attention devoted to the production of the unit itself has resulted in efficient design and economical operation which, however, may be nullified by unsuitable accessories. Vent pipes subject to corrosion and quick failure are an example of this.

The failure of an accessory to function necessitates its renewal, resulting in expensive costs for parts, labor and transportation. While these changes are of a known amount, much greater losses of an extent difficult to evaluate are being created. Customer good will resulting from satisfactory operation of equipment is expressed in recommendations to friends to make similar purchases. The unsatisfactory operation of the equipment, on the other hand, eliminates such expressions of satisfaction and often results in aggressive efforts to prevent the purchase of similar equipment by others. This situation causes a resistance to sales efforts more powerful than advertising can overcome.

The offending accessory is sometimes furnished by the manufacturer of the gas burning apparatus and sometimes not, but in any event he is blamed for its failure if for no other reason than that he did not recommend a suitable accessory for the service. Since this situation exists, it is a safe plan to be acquainted with the items used in conjunction with gas burning units in order that advice may be given regarding the entire installation so that its operation may in every respect be successful.

The above facts lead to the conclusion that when failure of any part of a gas heating system occurs, the cause of failure should be investigated with the idea of remedying the condition permanently even if a more costly material must be used, for after all, the sale of gas burning equipment is the result of the public's desire for an automatic heating system. Anything that interferes with the success of such a system reacts against both the sales of the manufacturer of gas burning equipment and the building of load by the public utilities furnishing gas.

Flue and Vent Pipe Difficulties

One of the accessories used with gas burning central heating plants, water heaters, clothes dryers, space heaters and other equipment, which has caused a great deal of difficulty, is flue and vent pipe. Since this part of the system must withstand corrosion from the products of combustion in combination with moisture and must also resist rapidly changing temperatures, sometimes running as high as 600 deg., there is ample reason for failures unless care is devoted to the selection of material suitable for this purpose. A further requirement for this service is the ability of the material selected to have some insulation ability as this keeps the products of combustion above the dew point for as long a period of time as possible. This feature is emphasized when a portion of the flue pipe is carried on the outside of a building exposed to the atmosphere.

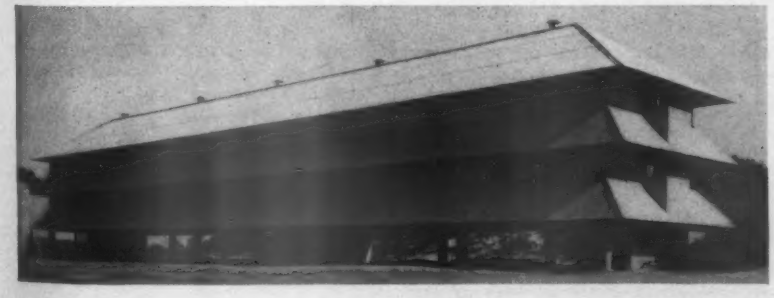


Figure 1

Figure 2

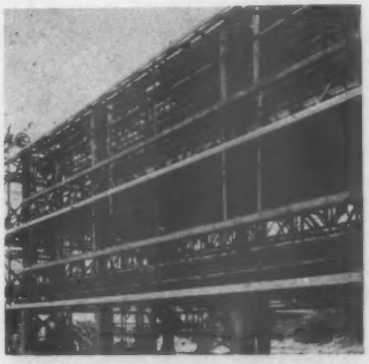


Figure 3

A recently completed gas heating project contained problems of venting which were unusual and give particular point to the comments above. When the Hotel Indiana Dunes, State Park, at Tremont, Indiana was designed by John Lloyd Wright, architect, it was decided to heat its fifty sleeping rooms with Gasteam Radiators. The installation, which consisted of 238 sections comprising 1452

square feet of radiation, included a vented radiator in each room and four unvented radiators in the hallways.

Vented gas steam radiators were chosen as the most serviceable and economical system of heating the hotel as it is occupied principally by vacationers and week-enders and is open from February to December only. Therefore, heat must be obtainable at all times during the cold months in some rooms. It is very possible that at some times, only a few rooms are in use and in such cases, it is only necessary to turn on the radiators in those rooms. No heat is wasted in other parts of the building.

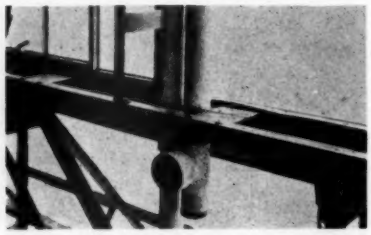


Figure 4

Inconspicuous Connections

Though fifty vent pipes were required—one from each of the twenty-five radiators located on each of the two floors—it was necessary to carry the products of combustion to the atmosphere without impairing the appearance of the building. Figure 1 shows the exterior of the finished structure with the five vent outlets through the roof which are the only visible portions of the radiator venting system while the photograph of the interior of a typical room shows the inconspicuous radiator connection to the system.

Figure 5

The wall construction consists of steel framing members which support a wall of metal lath and stucco on the outside and metal lath and plaster on the inside, with an eight-inch air space between the exterior and interior walls. It was in this space that the vent pipes were located in pairs, one from the lower floor and one from the upper floor both entering a junction box at the eave level inside the attic. The photograph of the steel framing with the vents in place shows the general arrangement, while the close-ups at the second floor radiator connection and the eaves show the construction in detail at these points.

A single vent pipe was carried from the junction box parallel to the roof slope, to the vent outlet at the ridge. Here with four other pipes a master junction box was installed which formed the outlet for ten radiators. The master junction box ready to receive the pipes from the risers but not yet connected to the vent outlet, is shown in the accompanying photograph.

This system of venting disposed of the products of combustion at a point at least two feet above the highest point of the roof. If vents are carried through the roof at the eaves, there will be down drafts in the vent stack in most cases especially where the pitch of the roof is steep.

Horizontal offsets were avoided as they reduce the draft; the runs in the attic spaces followed the pitch of the roof, which was steep. The pipe was extended about 12 inches below the vent connections from the radiators to form a condensation pocket. When the pipe becomes hot, any condensate which has collected will evaporate.

The risers are three inches while the pipes in the attic space leading from the junction boxes to the vent outlets are four inches. The vent outlets are ten inches square.

The pipe selected for the vent lines was Johns-Manville Transite Pipe which is manufactured from asbestos fibre and Portland cement.

Elaborate tests for ability to withstand corrosion, temperatures up to 700 degrees F. and resistance to transmission of heat through the walls of the pipe were made by the Underwriter's Laboratory as the basis of approving it. The lengths of pipe and

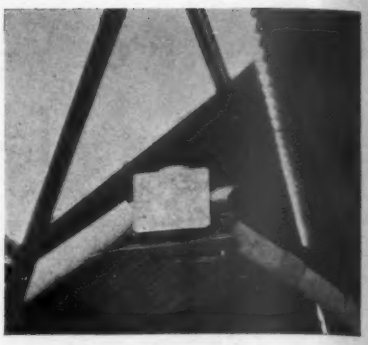


Figure 6

fittings of the same material are connected by tapered push couplings which make assembly economical and assure a tight system.

Successful Features

The features which contributed to the success of this system may be summarized as follows:

The selection of a type of heating system suited to the use of the structure, economy as well as efficiency being carefully considered.

Radiation requirements accurately calculated.

The amount of unvented radiators kept at a minimum to prevent moisture condensation.

A. G. A. Requirements for House Piping and Installation used in determining the size of vent pipes.

Vent pipes extended as nearly straight as possible from radiators to a point two feet higher than the highest point of roof.

Providing a drip pocket at least 12 inches below radiator vent connection.

The use of Transite asbestos pipe to eliminate replacement cost.

Institute Opens Washington Office

The Gas Appliances Institute has opened an office at Washington, D. C., where facilities are available for meetings of the organization; manufacturer members are invited to make it their headquarters when in the National Capital.

George W. Bean, representative of the Institute, is in charge of the office, 510 Albee Building. He may be reached by telephone—District 7696. By addressing this office members of the gas appliance industry may be assured that any matters they may desire taken up directly with Washington authorities will have prompt attention.

Gas Company Turns Brickbats into Bouquets

ONE gas company used advertising, following a serious service interruption, and turned potential critics into boosters.

It happened in Tennessee. On January 4, before daybreak, a weakened section of the Memphis Natural Gas Company's 447-mile pipe line, near Tunica, Miss., blew out. A standby plant was able to render partial service until the damage was repaired, which required twelve hours.

News columns of the daily papers gave wide publicity to the mishap. "Inasmuch as the interruption was the first experienced since the building of our eighteen-inch line from Monroe, La., to Memphis, in 1928, we thought it would be a good opportunity to turn what seemed at first a liability into an asset," D. C. Shaffer, vice-president and general manager of the company explained.

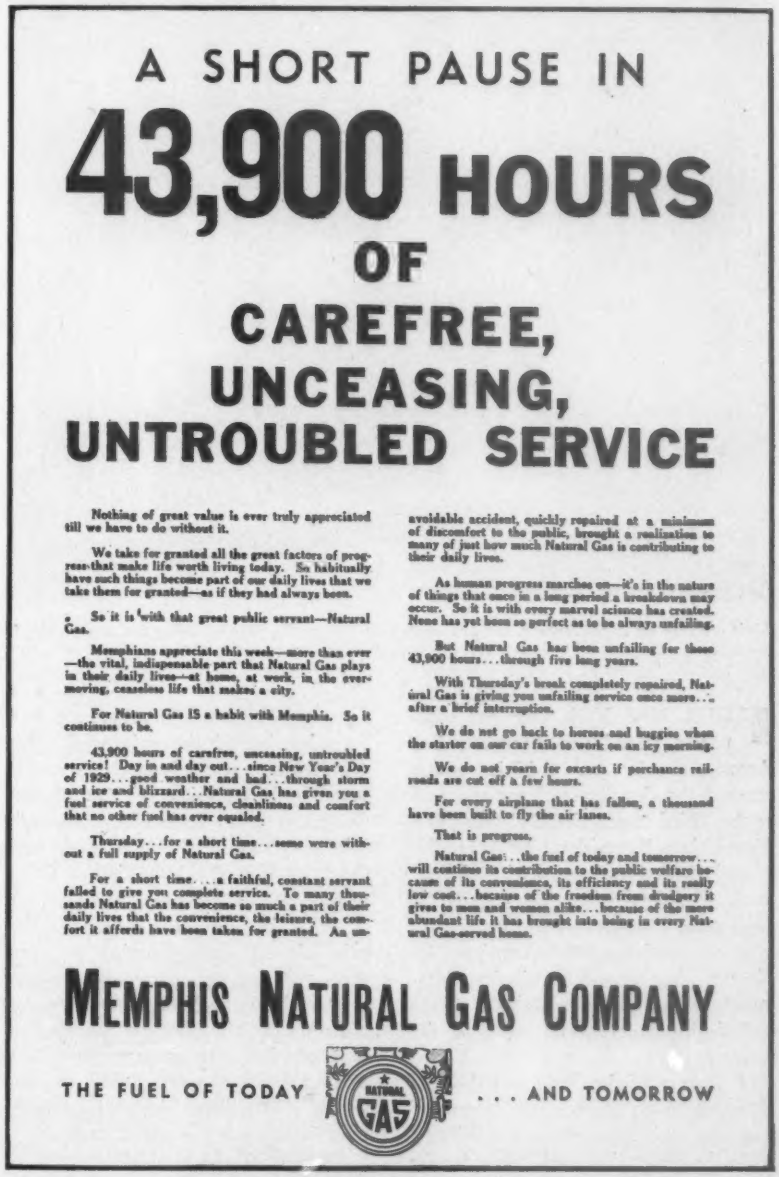
Instead of apologizing for the brief interruption of service and consequent inconvenience to housewives and others, the Memphis company made capital of its "43,900 hours of carefree, unceasing, untroubled service." The "disaster," as some called it, was treated by the company merely as "short pause" in service, in the newspaper advertisement which appeared the morning following the blowout. The copy pointed out that "nothing is ever appreciated until we have to do without it."

The advertisement pointed out the real value of natural gas service and called attention to the unfailing service rendered Memphis and forty other Tennessee, Mississippi, Arkansas and Louisiana towns served by the company continuously since the completion of the line in January, 1929.

"We do not go back to horses and buggies when the starter on our car fails to work on an icy morning," the copy explained. "We do not yearn for oxcarts if perchance railroads are cut off for a few hours. For every airplane that has fallen, a thousand have been built to fly the airlanes. That is progress."

Favorable reaction to this the advertisement included a first column editorial quoting and reiterating its message in the Memphis *Press-Scimitar*.

Action of the Memphis company in converting the service break into a source of good will has received wide attention in the gas and advertising trade press.



A SHORT PAUSE IN

43,900 HOURS OF CAREFREE, UNCEASING, UNTROUBLED SERVICE

Nothing of great value is ever truly appreciated till we have to do without it.

We take for granted all the great factors of progress that make life worth living today. So habitually have such things become part of our daily lives that we take them for granted—as if they had always been.

So it is with that great public servant—Natural Gas.

Memphians appreciate this week—more than ever—the vital, indispensable part that Natural Gas plays in their daily lives—at home, at work, in the ever-moving, ceaseless life that makes a city.

For Natural Gas IS a habit with Memphis. So it continues to be.

43,900 hours of carefree, unceasing, untroubled service! Day in and day out...since New Year's Day of 1929...good weather and bad...through storm and ice and blizzard...Natural Gas has given you a fuel service of convenience, cleanliness and comfort that no other fuel has ever equaled.

Thursday...for a short time...some were without a full supply of Natural Gas.

For a short time...a faithful, constant servant failed to give you complete service. To many thousands Natural Gas has become so much a part of their daily lives that the convenience, the leisure, the comfort it affords have been taken for granted. An unavoidable accident, quickly repaired at a minimum of discomfort to the public, brought a realization to many of just how much Natural Gas is contributing to their daily lives.

As human progress marches on—it's in the nature of things that once in a long period a breakdown may occur. So it is with every marvel science has created. None has yet been so perfect as to be always unfailing.

But Natural Gas has been unfailing for those 43,900 hours...through five long years.

With Thursday's break completely repaired, Natural Gas is giving you unfailing service once more...after a brief interruption.

We do not go back to horses and buggies when the starter on our car fails to work on an icy morning.

We do not yearn for oxcarts if perchance railroads are cut off a few hours.

For every airplane that has fallen, a thousand have been built to fly the air lanes.

That is progress.

Natural Gas!...the fuel of today and tomorrow...will continue its contribution to the public welfare because of its convenience, its efficiency and its really low cost...because of the freedom from drudgery it gives to men and women alike...because of the more abundant life it has brought into being in every Natural Gas-served home.

MEMPHIS NATURAL GAS COMPANY

THE FUEL OF TODAY ... AND TOMORROW

The advertisement which turned the tables

First Demonstration of Gas Unit Summer Air Conditioner Seen at Heating Show

Unit summer air conditioner developed by Bryant Heater & Manufacturing Co. and A. G. A. Committee on Industrial Gas Research

FOUR New York City gas companies joined the American Gas Association in an exhibit which stressed the cleanliness of gas as a fuel at the Third International Heating and Ventilating Exposition, held in the Grand Central Palace, New York, the week of February 9. The exposition took place simultaneously with the annual convention of the American Society of Heating and Ventilating Engineers, which attracted about 1,000 technical men from all parts of the country.

A feature of the show was the first demonstration of the application of gas to a unit summer air conditioner. This demonstration took place in the booth of The Bryant Heater & Manufacturing Company, Cleveland, O., and extended through the entire week. This development, which is a product of the research laboratories of the Bryant Company was undertaken through joint sponsorship of that company and the American Gas Association Committee on Industrial Gas Research.

The unit conditioner is built on the principle of dehumidifying air and then reducing the dry bulb temperature with the aid of fin-type water radiators. This principle, as applied to entire building summer air conditioning, has been perfected by the Research Committee during extended tests throughout the past four years.

The air is conditioned initially by adsorbing, through the power of capillary attraction, most of the moisture it contains. This is accomplished by passing air through an adsorbent material which acts much like a superblotter, and the air leaves the bed drier than the air of Sahara. It is then mixed with air recirculated from the room, which gives a resultant relative humidity of the highest degree of comfort. The mixture of treated air and recirculated air is then reduced to the comfort temperature by passing over the fin-type water radiators from which it is discharged directly into the room as a gentle and invigorating breeze. The activation material is, at the end of the cycle, heated with gas and the moisture that had been previously extracted from the air is carried off suspended in the products of combustion.

With the humidity reduced to the comfort point the pores of the skin get a chance to breathe freely and additional comfort is assured from the cooling and movement of the air.

The unit conditioner is enclosed in a casing of practical size and attractive finish, for installation directly in living rooms, dining rooms, bedrooms, stores or shops. If desired, it can be placed in the basement directly below the room to be conditioned and the air brought to the room through a register.

Plans for introducing the gas unit conditioner to the industry are being made by the Bryant Heater Company.

Manufacturers of gas boilers and heaters of many types had complete exhibits in addition to the display sponsored by the New York gas companies and the Association. The New York companies taking part included the Consolidated Gas Company of New York, The Brooklyn Union Gas Company, Brooklyn Borough Gas Company, and the New York & Richmond Gas Company.

One of Old Guard Gives a Glimpse into Past Of Gas Industry

Frederic Egner

By Frederic Egner

WHEN one week past ten years of age, my life-work began as a boy-laborer in a large factory at College Point, New York. Working ten hours per day and six days a week, I was paid one dollar. I learned the trade of machinist and by means of self-education acquired a fair knowledge of the steam engine—locomotive, stationary and marine.

When nineteen years of age I volunteered in the United States Navy for the "War for the Preservation of the Union," as it is called on my "Honorable Discharge" from the service. I was appointed acting third assistant engineer; resigned when the war was over and received an honorable discharge in 1866.

I then worked at my trade for a little while; and after that served as an "engineer of steamer" in the Metropolitan Fire Department, New York. Later, I was appointed a lieutenant; member of the Board of Examining Engineers, and then served several years as a captain in the department, from which I resigned early in the spring of 1872, when I became an extra licensed steam engineer and general foreman of the works of the Metropolitan Gas Light Company, New York. The works were located at the foot of West Forty-second Street, that city.

The president of the company was the late Oscar Zollikoffer, later one of the vice-presidents of the Consolidated Gas Company of New York. I. Herzog was the chief engineer of the company and Alexander Strecker, superintendent of street department, and my position really approximated to being Mr. Herzog's first assistant. The "night boss" of the works was Wm. Lundy.

I was soon given charge of reorganizing the forces employed at the works, which was a source of much practical knowledge to me of how to get the best results from the material used to produce the gas, and especially the best methods of handling both apparatus used, and men employed, in the manufacture of gas.

It was at the Metropolitan Gas Works where so-called gas oil was first used in combination with gas coal in the manufacture of illuminating gas.

At that time as there was much talk of "strikes" for an eight-hour day in the various gas works of New York, I took measures, accordingly, to put my company in a fairly good defensive position.

On April 5, 1873, the retort house employees of the New York Gas Light Company went on strike and tried to get the men of the Manhattan Gas Light Company to also go on strike, but they refused. They marched over to West Forty-second Street, and shouted for our men "To come out, 'Min,' come out!" But as I was ready to replace every man there—and the men knew it—not one started out.

Our president had admired and approved my method of dealing with the men; and he relieved me of my duties at the Forty-second Street works and put me in charge of the relief which he was going to send to the New York Gas Light Company's works which were at the foot of East Twenty-first Street. The late Cornelius Everitt was the president and Charles Carroll Mowton, chief engineer of the latter company.

Those works occupied three blocks in that section of New York; one side of the plant was bounded by the East River, the other end by Avenue A and the sides by Twenty, Twenty-first and Twenty-second Streets. There were seven gas holders there—one of one million cu.ft. capacity; and six of each 300,000 cu.ft. capacity, with a new million cu.ft. gas holder being erected on part of that property.

Mr. Zollikoffer had prepared and published advertisements in some of the New York newspapers for men to work for the New York Gas Light Company, and by Sunday night, April

This brief autobiography is from the pen of a man who spent fifty-three active years in the gas industry, during which period he won a wide reputation as a successful engineer. On March 5, Frederic Egner will celebrate his eighty-eighth birthday at his home in Washington, D. C., where he has retired as a consultant. Following is a sketch of his career in the industry: Metropolitan Gas Light Company, New York, 1872; New York Gas Light Company, New York, 1873; City Gas Company, Norfolk, Va., 1877; The Peoples Gas Light & Coke Company, Chicago, Ill., 1883; The Laclede Gas Light Company, St. Louis, Mo., 1883; Standard Gas Light Company of New York, 1890; City Gas Company, Norfolk, 1893. He also was president, manager and construction engineer at St. Charles and Moberly, Mo.; Texarkana, Texas, and Fredericksburg, Va. In 1891, Mr. Egner was president of the Western Gas Association. For years he has been a member of the American Gas Association.

6, after the strike, he sent me over to those works with these men.

While on the way there, the strikers intercepted these men and persuaded them not to go, and by the time I reached the works all had deserted me.

When Mr. Mowton exclaimed, "Bring in your men," I had to tell him what had happened but assured him that he would get effective help within less than twelve hours.

I started back, and when I arrived at the corner of Avenue A and Twenty-first Street, was surrounded by the strikers and saw them digging up cobblestones to attack me.

Has Drink with Strikers

One of these strikers, called "Big Black Tom O'Moore" saw it too, and shouted "Min, don't do that! That's Mr. Egner; the best frind ye have"—and it all ended by the strikers insisting upon my going into a near-by saloon and drinking with them.

On the next Monday morning we hired a side-wheel tugboat and brought new men to the gas works, landing them on the river side so they could walk into the works without molestation. The more than 500 Italian laborers previously hired by the New York Gas Company were loaded on the steamer *William Fletcher* which took them safely out of the strikers' power. In the meantime, my new men had been assigned to positions by new foremen, under my instructions, and the gas holders were going up, and the strikers hopes of success down. Three days later that strike was "broken."

Four years later, when I was notified, that "By reason of the necessity of reducing expenses, your services will not be required after the first of the month," the men employed there brought a heavy gold watch to my house and on the inside-back of the case are engraved the following, "Presented to Frederic Egner by the Employees of the New York Gas Works, on April 10th, 1877." I still have that watch.

Later I was connected with the City Gas Light Company of Norfolk, Virginia, whose president was the late Charles S. Allmand, who wrote me that if I could get anything like the results which I claimed to have obtained with the New York Company the Norfolk Company would give me a permanent position with a good salary, and so I went to Norfolk, in October, 1877. There I found a newly erected coal gas works of a fine type but poorly managed. It was an easy thing to improve results at that nice coal gas works.

Serving the Norfolk Company as engineer, I was with it several years, when the late A. M. Billings, then president and largely owner of The Peoples Gas Light and Coke Company, of Chicago, wrote to me and offered to make me chief engineer of his company at a whopping big salary if I would come on to Chicago. And I did in May, 1884.

My work in Chicago was the remodelling, building and operating what was then known as the "Springer Water Gas Apparatus." At first it was a flat failure, but became successful after I had entirely remodelled it.

Goes to St. Louis

I left Chicago and connected with the Laclede Gas Light Company, St. Louis, Missouri, of which the late William Farmer had been the engineer, leaving of his own accord, however, when I was given charge by the late Hon. Erastus Wells, who was the president of that company, and John J. Mitchell, president of the Chicago and Alton Railroad, was vice-president. Mr. Farmer, when he retired from the gas business, became a real "farmer" somewhere in Canada where he died. He was one of the leaders in gas engineering in his time and day. All those named became my personal friends.

The Norfolk people did not like my move to Chicago and Mr. Allmand told me that if I wished to return at any time within two years he would hold a place for me. I took charge at Norfolk a second time and after again partly rebuilding the works and installing a water gas process of my own design, I again resigned and hoped to retire from the gas business, but which was not to be.

In those ten years intervening between my first and last connection with the Norfolk Gas Company many interesting things happened. I served for some months as chief engineer of the Standard Gas Light Company, New York City, of which the late Russell Sage was president. Later I rebuilt the works at foot of East 119th Street and made peace with Tammany Hall for the company.

I tried going in business on my own hook, making a trip to Europe, where I had the honor and pleasure of meeting many of the leaders in the foreign gas business.

My last job in the gas industry was in Fredericksburg, Virginia, where I designed and erected a new gas works at the solicitation of the City Council.

Program for Joint Conference at Memphis

ACCORDING to an outline of the tentative program the following speakers have accepted invitations to deliver addresses at sessions of the Southern Gas Association and Southern-Southwestern Sales Conference, which will take place at the Peabody Hotel, Memphis, Tenn., March 21-23:

General Sessions:

F. L. Chase, vice-president, Lone Star Gas Comany, Dallas, Texas, and chairman of the Natural Gas Department, American Gas Association; Kurwin R. Boyes, secretary, American Gas Association, New York; H. F. Smiddy, Electric Bond and Share Company, New York.

Sales Conference:

J. F. Orr, United Gas System, Houston, Texas; C. L. Trevitt, Community Natural Gas Company, Dallas, Texas; C. B. Gamble, Birmingham Gas Company, Birmingham, Ala.; E. C. Whitcomb, Lone Star Gas Company, Fort Worth, Texas; E. N. Avengo, New Orleans Public Service, Inc., New Orleans, La.; C. K. Patton, Dallas Gas Company, Dallas, Texas; H. E. Randall, United Gas System, Houston, Texas; C. C. Tucker, Municipal Gas Company, Decatur, Texas; D. H. Levan, Jacksonville Gas Company, Jacksonville, Fla.; W. E. Parrott, Memphis Power and Light Company, Memphis, Tenn.; R. C. Anderson, Mississippi Power & Light Company, Jackson, Miss.; L. L. Baxter, Southern Union Gas Company, Fayetteville, Ark.; Ed. Brewer, Atlanta, Ga.; J. M. Clann, New Orleans Public Service, Inc.; New Orleans, La.

At the final session on Friday, March 23, one of the features will be the presentation of a playette, "Kitchen Modernization." Speakers at this time will include H. E. Dexter, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.; C. E. Dougherty, Chattanooga Gas Company, Chattanooga, Tenn.; Rawson Collier, Southern Natural Gas Company, Birmingham, Ala.; Vernon R. Brown, Lone Star Gas Company, Fort Worth, Texas; C. B. Wilson, Little Rock Gas and Fuel Co., Little Rock, Ark.; O. A. Kinzier, Dallas Gas Company, Dallas, Texas.

Affiliated Association Activities

New Jersey Gas Association

THE twenty-third annual convention of the New Jersey Gas Association will be held at the Stacy-Trent Hotel, Trenton, March 23. Herbert O. Caster, president of the American Gas Association, will be the guest of honor. Judge Caster, who will be introduced by Alexander Forward, managing director of the American Gas Association, will deliver an address on "The Position of the Gas Industry in the National Political Scene."

Other speakers and the topics which they will discuss are: R. L. Hallock, of The Brooklyn Union Gas Company, "Experiences with the Electrolux"; Preston D. Gardner, agent, Public Service Electric and Gas Company, "The Forgotten Customer"; Frank A. Engel, superintendent of distribution, Elizabethtown Consolidated Gas Company, "Flues, Venting and Chimneys"; R. F. Cleary, Homestead Heater Company, "Auxiliary Gas Space Heaters," and C. George Segeler, engineer of utilization, American Gas Association, "The New Deal in Water Heaters."

The one-day program will open at 10 A.M. with a business session at which the reports of various operating committees will be made and the election of officers and directors of the association for the year 1935 will be held. Luncheon will be served for all guests at the hotel, following which, Public Service Electric and Gas Company will produce a playlet entitled "The Modern Kitchen."

It is estimated that more than 400 persons, including officials and employees of member gas companies, manufacturing and associate members and their friends and guests will be in attendance.

Frederick A. Lydecker, general superintendent of distribution, Public Service Electric and Gas Company, is president of the Association.

Convention Calendar

March

6- 7 Oklahoma Utilities Association
Tulsa, Okla.

21-23 Southern Gas Association and Southern Southwestern Regional Sales Conference
Peabody Hotel, Memphis, Tenn.

22-23 Annual Spring Conference, Technical Section, Pacific Coast Gas Association
Los Angeles, Calif.

23 New Jersey Gas Association
Stacy-Trent Hotel, Trenton, N. J.

25-30 American Chemical Society (87th Meeting)
St. Petersburg, Fla.

29-30 Joint Spring Conference, Commercial, and Publicity and Advertising Sections, Pacific Coast Gas Association
Los Angeles, Calif.

April

9-10 A.G.A. Distribution Conference
Book-Cadillac Hotel, Detroit, Mich.

16-17-18 Mid-West Gas Association
Sioux City, Iowa

19-20 Missouri Association of Public Utilities
The Elms Hotel, Excelsior Springs, Mo.

24-26 Southwestern Gas Measurement Short Course, College of Engineering
University of Oklahoma, Norman, Okla.

May

1- 4 U. S. Chamber of Commerce
Washington, D. C.

9-10 Pennsylvania Gas Association
Wernersville, Pa.

12-19 International Petroleum Exposition
Tulsa, Okla.

14-18 National Fire Protection Association
Haddon Hall, Atlantic City, N. J.

15-17 Natural Gasoline Association of America
Tulsa, Okla.

21-22 A.G.A. Joint Committee Conference of Production and Chemical Committees
Hotel New Yorker, New York, N. Y.

22-24 Mid-Year Meeting—American Petroleum Institute
Pittsburgh, Pa.

24 National Board of Fire Underwriters
New York, N. Y.

June

4- 5 Canadian Gas Association
Montreal, Canada

4- 7 Edison Electric Institute
Atlantic City, N. J.

5- 8 The Institution of Gas Engineers
London, England

18-21 National Association of Purchasing Agents
Cleveland, Ohio

25-29 American Institute Electrical Engineers
Hot Springs, Va.

September

1- 4 International Gas Association
Zurich, Switzerland

9 American Trade Association Executives
Wernersville, Pa.

24-28 American Transit Association
Cleveland Public Auditorium, Cleveland, Ohio

October

Wk. 29 American Gas Association Convention and Exhibition
Atlantic City, N. J.

Oklahoma Utilities Association

A STOCK-TAKING of the situation confronting each branch of the public utility industry, and of the industry as a whole, best describes the program for the sixteenth annual convention of the Oklahoma Utilities Association, to be held at Tulsa, March 6-7. Leaders of the gas, electric, electric railway, telephone and utility equipment manufacturing groups will discuss the problems of the hour, each from his own point of view.

An outstanding feature will be an address on "Trends in Public Regulation," by E. E. McInnis, of Chicago, general counsel of the A. T. & S. F. Railway Co.; F. B. MacKinnon of Chicago, president of the United States Independent Telephone Association; H. S. Bennion of New York, assistant managing director of the Edison Electric Institute; Labert St. Clair, of New York, advertising manager of the American Transit Association; Kurwin R. Boyes, of New York, secretary of the American Gas Association, and Earle W. Hodges, of Henry L. Doherty & Company, New York, are among the men identified with the several branches of utility operation who will go to Oklahoma for this gathering.

J. F. Owens of Oklahoma City, president of the National Electric Light Association during the last year of its existence, will speak on "Today's Challenge to Industry." Other speakers from Oklahoma and near-by States will handle the more local problems of today.

The annual dinner will be held March 6 with Edward B. Downie, of Little Rock, Arkansas, general attorney for Arkansas for this Southwestern Bell Telephone Company, as speaker.

The annual election will be held March 7. R. J. Benzel of Oklahoma City, vice-president of the Southwestern Bell Telephone Company, is president and H. B. Cobban, of Miami, Oklahoma, general manager of the Northeast Oklahoma Railway, is first vice-president. Registration exceeding 500 is expected.

New England Gas Association

FOUR hundred members attended the annual business conference of the New England Gas Association, in Boston, Mass., February 8 and 9, when matters of importance confronting the industry today were discussed by well-known leaders. These included addresses by two officers of the American Gas Association—H. O. Caster, president, and Alexander Forward, managing director. A digest of Judge Caster's talk appears in this issue of THE MONTHLY.

Major Forward outlined the progress of the A.G.A., and, among other things, said: "We are in an era of rebuilding, to replace a very considerable amount of wreckage strewn all over the map, but, I hope, upon the old foundation of liberty and opportunity."

Officers and directors of the New England Gas Association. Front row, left to right—David Daly, Pawtucket, R. I.; H. R. Sterrett, New Haven, Conn.; R. H. Knowlton, Hartford, Conn., First Vice-president; F. M. Goodwin, Boston, Mass., President; F. L. Ball, Boston, Mass., Second Vice-president; F. D. Cadwallader, Boston, Mass., Treasurer; I. T. Haddock, Cambridge, Mass.

Middle row—Clark Belden, Boston, Executive Secretary; G. S. Hawley, Bridgeport, Conn.; A. E. Norton, Boston; W. M. Africa, Manchester, N. H.; R. M. Leach, Taunton, Mass.; John West, Fall River, Mass.; Carl Cummings, Boston, Mass.

Back row—R. L. Fletcher, Providence, R. I.; H. L. Dalbeck, Cambridge, Mass.; Howard B. Hall, East Braintree, Mass.; G. W. Stiles, Portland, Me.; John A. Weiser, Newport, R. I.; W. S. Anderson, Boston, Mass.; R. S. Carter, Malden, Mass.

W. C. Bell, of Boston, and W. H. Lawson, of Rutland, directors, and W. L. Doering, of Boston, assistant treasurer, are not included in the above group.

H. R. Sterrett, president of the New England association, was optimistic over the state of the industry within the territory embraced by his organization.

Some of the problems of regulation were treated in a paper presented by Richard T. Higgins, president of the National Association of Railroad and Utilities Commissioners and chairman of the Connecticut Public Utilities Commissions.

Dr. Vannevar Bush, vice-president of the Massachusetts Institute of Technology, told the conference that he thought there is considerable place in the gas industry for more fundamental research and development, with emphasis on applied research of a fundamental nature.

The Association, which voted to incorporate, elected the following officers:

President, F. M. Goodwin, Boston Consolidated Gas Company; First vice-president, R. H. Knowlton, The Connecticut Light & Power Company; Second vice-president, F. L. Ball, Charles H. Tenney & Company; Treasurer, F. D. Cadwallader, Boston Consolidated Gas Company; Directors: H. R. Sterrett, W. M. Africa, W. C. Bell, David Daly, R. L. Fletcher, I. T. Haddock, George S. Hawley, W. H. Lawson, R. M. Leach, A. E. Norton, G. W. Stiles, J. A. Weiser, John West.

Mid-West Gas Association

ONE of the principal speakers at the annual convention of the Mid-West Gas Association, which will be held in Sioux City, Iowa, April 16-18, will be R. W. Hendee, president of the Oklahoma Natural Gas Corporation, Tulsa, Okla. He will speak on "Advantages of Natural Gas to Local Gas Companies." Other speakers will include men of prominence in the gas industry, according to the tentative program announced by R. B. Searing, secretary-treasurer of the association. R. L. Klar, of the Des Moines Gas Company, will preside over the three-day meeting.

"Experience in Cracking and Mixing Various Gases" is the subject of a paper to be delivered by J. A. Perry, of the United Gas Improvement Company, Philadelphia, Pa., which is expected to attract unusual attention. Mr. Perry is a former chairman of the Technical Section of the American Gas Association and has conducted considerable research on his subject. Another important paper to be presented will be "Selling Water Heating the Year Around," by Hall Henry, of the Associated Gas & Electric Company.

Other speakers and their subjects included in the tentative program are: H. J. Carson, chief engineer, Northern Gas & Pipe Line Company, "Possibilities in New Homes"; Miss Dorothy McGeehan, International Nickle Co., "Kitchen Planning"; G. A. Neal, vice-president and general manager, Sioux City Gas & Electric Company, "Faith, Hope and Charity"; Stanley Taber, Iowa-Nebraska Light & Power Company, "Bringing to Life Dead Services"; Vernon Myers, Iowa Public Service Company, "How To Learn How To Sell"; F. J. Gunther, Iowa-Nebraska Light & Power Company, "Servicing House Heating Equipment."

According to the announcement, the final program will include some speakers who have not yet been confirmed. Convention headquarters will be at the Hotel Warrior.

Missouri Association of Public Utilities

THE twenty-eighth annual convention of the Missouri Association of Public Utilities will be held April 19 and 20, at the Elms Hotel, Excelsior Springs, Mo. President Fred Karr will preside at the business sessions.

H. O. Caster, president of the American Gas Association, will be one of the speakers.

The program, now almost complete, is in charge of the following committee: C. A. Semrad, chairman, St. Joseph Railway, Light, Heat, and Power Co., St. Joseph, Mo.; C. J. Prashaw, Missouri Power & Light Co., Kansas City, Mo.; Dudley Sanford, St. Louis County Gas Co., Webster Groves, Mo.; R. L. Shuck, Springfield Gas & Electric Co., Springfield, Mo.; H. E. Scheark, Kansas City Power & Light Co., Kansas City, Mo.

An "Open Forum" for the discussion of local utility problems will be held on the night of April 19, with D. W. Snyder, Jr., Missouri Power & Light Co., Kansas City, Mo., as chairman. The annual dinner and dance will take place the evening of April 20.

Officers of the association are: President, Fred Karr, St. Joseph Gas Co., St. Joseph, Mo.; first vice-president, D. W. Snyder, Jr., Missouri Power & Light Co., Kansas City, Mo.; second vice-president, C. E. Michel, Union Electric Light & Power Co., St. Louis, Mo.; third vice-president, C. F. Farley, Kansas City Power & Light Co., Kansas City, Mo.; secretary, N. R. Beagle, Missouri Power & Light Co., Jefferson City, Mo.; assistant secretary, Jesse Blythe, Jefferson City, Mo.; treasurer, Hermann Spoehrer, Union Electric Light & Power Co., St. Louis, Mo.

New officers for the coming year will be elected at the closing session, April 20.

Mr. Hendee Again Elected O. N. G. President

ROBERT W. HENDEE, of Tulsa, who succeeded E. A. Olsen as president of the Oklahoma Natural Gas Corporation, and was succeeded by A. E. Bradshaw in the reorganization of that company last fall, was again elected president on January 27 to succeed Mr. Bradshaw who resigned to become president of the National Bank of Tulsa. Mr. Hendee is looked upon as an authority upon matters relating to the natural gas industry in general and affairs of the Oklahoma Natural in particular.

Cost of Water Heating by Furnace Coils

By F. W. Stone

General Manager
The Lake Shore Gas Co., Ashtabula, Ohio

SOMETIME ago in a bulletin to our employees on hot water heating, I said that the furnace coil was responsible for 20% of the annual coal bill when the furnace coil was inserted in the firebox of the furnace and was used for heating the domestic hot water requirements; quoting as authority, a bulletin of the Bureau of Standards. This statement was challenged and the following data was gathered to substantiate the statement:

Upon giving the matter consideration, I did not see that a statement assigning to the furnace coil any definite percentage of the annual coal consumption of the domestic heating furnace could be truthfully made, or that the statement of the furnace coil was responsible for 20% of the annual coal consumption could be verified by any tests such as a laboratory test would be because the quantity of hot water used by a family would not probably be in proportion to the size of the heating plant or the coal consumption of the furnace. For instance: A mechanic, living in a six-room house and having a large family might use 2,000 gallons of hot water a month and require only about 8 tons of coal a year to heat the house, while another family consisting of a man and his wife, living in a large house, might only use 1,200 to 1,500 gallons of hot water a month and require 15 or 20 tons of coal per year to heat the house.

I believe, however, that there is enough evidence available to demonstrate that from 15% to 20% of the annual coal consumption of a house heating furnace can be attributed to the use of the furnace coil, furnishing the domestic hot water requirements.

Evidence is, generally speaking, of three kinds: hearsay or common report; evidence which may be the result of calculations or opinions of authorities; and evidence consisting of presentation of actual facts.

Common Report

If evidence of this kind is admitted in a court of law, and it surely is, in regard to character of persons and other related subjects, it should be admitted in the consideration of this question. I have looked through the records of the various gas associations for the past ten years, through the publications of the gas industry and find innumerable references saying that the furnace coil is responsible for 20% of the annual coal bill. This statement is made in various ways by persons who ought to know.

In 1927, in a report of "Subcommittee on Circulating Tank Water Heaters" given by F. M. North, of the Northern Indiana Public Service Co., Hammond, Ind., reported on page 474 of the 1927 *A.G.A. Proceedings* as follows:

> "Another argument against the furnace coil is that it prevents the proper heating of the house, unless there is a sufficient excess capacity in the furnace to take care of the additional demand which a heating coil puts upon it.
>
> "The high temperature water usually produced by a furnace coil has a bad effect on the hot water fixtures and adds a maintenance cost which we would not have with water heated in a gas water heater. Some authorities cite the cost of operating a furnace coil as equivalent to from 15% to 20% of the season's fuel cost."

In 1928, in a report by the same committee on "Successful Sales Plans" given by C. L. Ridley, Jr., Nashville Gas & Heating Co., Nashville, Tenn., quoted on pages 526 and 527 of the *A.G.A. Proceedings* for 1928, as follows:

> "It is a very common belief, Mrs. Prospect, that it doesn't cost anything to heat water with a coil in your furnace, but you know we never get anything for nothing in this world. It takes heat units to heat water, just the same as it does to heat your house or to do your cooking. When the cold water circulates through the coil in your furnace, it must take out a certain amount of the heat to make that water hot—heat that ought to be heating your home. As a matter of fact, we have ample proof and undoubted authority from actual tests showing that the water heated this way takes about one-fifth of the total amount you use in your furnace. In other words, every time you put five shovels of coal in your furnace, one shovel goes to heat the hot water."

> "The furnace manufacturers themselves, and you must agree that they ought to know something about it, in figuring the size of the furnace for a home, always take into consideration whether a furnace coil is to be installed or not. If the coil is to be installed they always specify a larger furnace, knowing that the coil is going to have a very decided effect on the results."

On page 493 of the 1930 *A.G.A. Proceedings* is an advertisement sponsored by the Water Heating Committee and approved by the Association which makes the direct assertion:

> "—yet, this crude pipe continually squanders 400 lbs. out of every ton of fuel that goes through the furnace door. Why not junk the old coil?"

Even as far back as 1922 this matter was discussed. In an article "Gas Men Should Use Gas Heaters" by F. A. Lemke, Kalamazoo, I quote from page 78, July 15, 1922, *Gas Age-Record*, as follows:

> "A few days ago a prominent advertising man from Chicago happened to be in Kalamazoo, called at our office because of mutual friends. He stated that about a year ago he placed an automatic gas water heater in his home in Highland Park, Ill. He did away with a hot water coil in his furnace for winter use, and a coal water heater for summer use. He found that the removal of the hot water coil from his furnace cut down his winter coal assumption ¾ ton per month."

In the *Gas Age-Record* for May 28, 1927, page 800, from article on "Furnace Coils Are Tape Worms of Water Heating Load" by F. X. Mettenet of the Northern Indiana Public Service Company, the following assertion is made:

> "Our friends, the furnace manufacturers, know its real nature. It is their practice always to increase the size of the furnace by 20 per cent specified for a job when a furnace coil is to be used with it."

In the Industrial Gas Series Water Heating of 1930, page 95, statement is made:

> "Such a house might take anywhere from 10 to 12 tons of coal, however, per heating season, and over this same period would require about 1½ tons of coal for water heating."

From the Water Heater Manual of the Hydro-Electric Power Commission of Ontario, Canada, page 30-31:

> "The furnace coil is generally believed to supply heat for a domestic range boiler at little or no cost. This illusion has been disproven in the Laboratory as well as in the home. Attached to an ordinary 30-gallon boiler a coil uses up the equivalent of two fair-sized radiators of furnace heating capacity. Normally, furnaces installed in the average home are just large enough to meet the house heating requirements and to add the extra radiation created by the 30-gallon tank reduces the capacity of the furnace by as much as 20 per cent. resulting in a poorly heated home. To provide the extra furnace capacity required by the coil may involve an additional outlay of from $50.00 to $150.00 when the furnace is installed.
>
> "Translated into fuel cost a furnace coil may consume upwards of one-quarter ton of coal per month over and above that required for house heating purposes, and the cost of heating water by this means may run from $15.00 to $50.00 per house heating season, with an additional amount of from $10.00 to $25.00 to cover the cost of auxiliary heating by some other means during the summer months.
>
> "Furnace coils prevent proper combustion of the fuel."

The above sentiments are reported hundreds of times and are sufficient proof that "Common Report" evidence, which would be admitted in a court of law, is enough to convict the furnace coil of using 20% of the annual coal bill.

Authoritative Evidence

Almost all of the furnace or boiler manufacturers come out openly in their catalogs and say that when a furnace coil for domestic hot water requirements is to be used in the furnace or boiler installed, this should be taken into consideration in figuring the size of the furnace and an allowance made for the heat used by the furnace coil. Crane Company, in a letter dated December 29, 1933, makes the following statement:

"We feel that this is such a variable factor that we hesitate to make a general statement regarding how much should be deducted from the rate of capacity of the furnace or boiler for the insertion of such a coil. However, on our water heating boilers and steam boilers we do follow this plan.

"When the indirect heater (such as Bell & Cossett, Excelsior, or Taco) is installed above the water line we figure 2 sq.ft. of steam radiation to heat each gallon of water 100 deg. rise F."

The American Radiator Company, in "The Ideal Fitter," 54th edition, page F 35, makes the following statement:

"When domestic hot water is heated by a coil in the firebox or a steam coil in storage tank, the boiler load should be increased by an amount equal to 1½ square feet of equivalent (240 B.t.u.) direct radiation for each gallon of tank capacity."

The W. A. Case & Son Manufacturing Company catalog, 1932 edition, gives the following recommended table to carry the load:

"Select boiler based on attached load including piping and hot water requirements. Example:

Direct radiation	1,000 sq.ft.
Piping (actual or 25%)	250 sq.ft.
HW-60 gal. (1½ sq.ft.) =	90 sq.ft.
	1,340 sq.ft.

Select boiler with nearest E.D.R. rating to 1,340 sq.ft."

(Notice that they use the figure 1½ sq.ft. for each gallon of water heated.)

In National Heating Guide, Blue Book of the Industry, edition of 1930 by the National Radiator Corporation, page 12, the following information is given:

"Domestic Hot Water Supply. When coil in firebox is used, and small quantity of water is to be heated, multiply storage tank capacity in gallons—

for steam by.....2.0
for water by.....3.0"

In the above calculations, where hot water boiler capacity is stated, it is evidently meant the daily requirements for hot water service. That this is contemplated is borne out by a statement from The American Society of Heating and Ventilating Engineers Guide, 1932 edition, page 216, which is as follows:

"If the burden of the hot water requirement is added to the house heating boiler care must be taken to make certain that the capacity of the boiler is sufficient to meet the increased demand. To heat one gallon of water 120 deg. requires about 1,000 B.t.u. which is approximately equal to 4 sq.ft. of equivalent heating surface (240 B.t.u. per square foot). If the maximum hourly demand is heated in one hour, the capacity of the boiler or heater should be increased by 4 sq.ft. (+) for each gallon heated. If sufficient storage capacity is provided, the additional boiler capacity required is correspondingly reduced."

Also from L. A. Harding & A. C. Willard; Mechanical equipment of buildings, Vol. 1, Heating and Ventilation, Edition 2, revised and enlarged, 1929, pages 437-438:

"The use of pipe coils inserted into the firebox of steam and water boilers and furnaces is a common but unsatisfactory means of heating the domestic supply. These coils not only reduce the capacity of the boiler for house heating, but also obstruct the fire-pot and chill the fire, thus interfering with proper combustion. Furthermore, since the heat transmission of these coils increases with the fire intensity, the hot water supply will be overheated in cold weather and under-heated in mild weather.

"The boiler manufacturers specify that when a hot-water coil is used the radiation capacity of the boiler must be reduced by 1½ sq.ft. of steam radiation and 2½ sq.ft. of water radiation for each gallon heated. This allowance is too small, unless from 2 to 3 hours is allowed for heating each gallon used."

It must be borne in mind, as indicated by the above authority, that the insertion of a coil in the furnace firebox does more than take heat away for the purpose of heating hot water, it also interferes with proper combustion by cooling the burning gases before they are properly consumed. Again quoting from The American Society of Heating and Ventilating Engineers Guide, 1932 edition, page 220:

"Good efficiency and proper boiler performance are dependent on correct furnace design embodying sufficient volume for burning the particular fuel at hand, for permitting of thorough mixing of air and gases, for permitting a velocity low enough to allow sufficient time for combustion to take place and for permitting the maintenance of a sufficiently high temperature to produce combustion."

"Combustion must take place before the gases are cooled by the boiler heating surface, and the volume of the furnace must be sufficient for this purpose."

In addition to the faulty combustion caused by the furnace coil, we must also figure the amount of extra fuel that is used by the householder firing up the furnace on mild days in order to secure sufficient quantity of hot water which otherwise would not be available. This firing and consequent consumption of fuel would not be called for if the furnace coil was not being used. It will be noted that all of the above authorities say that from 1½ to 2 ft. of steam radiation is required for each gallon of hot water heated per day. The average home in our section appears to figure about 350 ft. of steam radiation. 20% of that would be 70 ft. We figure that the average family's daily requirements of hot water are about 50 gallons. Figuring 1½ sq.ft. of radiation to each gallon heated would call for an allowance of 75 sq.ft. of radiation. This is more than 20% of the 350 required for heating the average home in this locality.

As we stated in the beginning of this paper, there are so many variables in the problem that it does not seem as though any laboratory test could be made which would give a satisfactory result. Some of these variables are the daily requirements of hot water in proportion to the heating load; the living habits of the family; how much hot water is required at any one time; is the furnace given extra firing to supply additional hot water when mild weather causes a low fire to be maintained for house heating; is the furnace fired regularly and combustion of such a nature that the services of the coil or the fire walls of the furnace itself do not become coated with soot?

Proof Developed by Presentation of Facts

We have secured a record of two tests, one is reported in the minutes of the Twenty-second Annual Meeting of the Indiana Gas Association, September, 1930, page 38, in a paper on "Use of Furnace Coils" by C. H. B. Hotchkiss, Purdue University, which reports:

"Coal fed to boiler with coil 230 lbs.
Coal fed to boiler without coil 194.2 lbs.

Difference of 35.8 lbs.
showing that the furnace coil consumed an additional 18.5% of fuel.
In the coal burned,
the quantity of
coal was 225.9 lbs. with coil
and 183.3 lbs. without coil

Difference of 42.6 lbs. which makes the furnace coil use 23.2% of the coal burned for heating the house."

Another test is available from Washington State College:

"A test was made on a nine-room house equipped with a hot water heating plant with 544 sq.ft. radiation, the boiler covered, and the piping partly covered, a hot water tank of 30 gallons' capacity, and

(Continued on page 106)

Atlanta Gas Light Co. Introduces New House Organ

THE Greater Gasco City News" is something new in the way of house organs which has been developed by the Atlanta Gas Light Company, Atlanta, Ga. Its prime object is to help build "Gasco City," an illusive municipality, but one which "The News" will treat as a reality.

In his salutatory, Legare Davis defines the purpose of the new publication as follows:

"With this issue the Gasco City News makes its bow. It has but one purpose—to help in the building of Gasco City. In the fulfillment of that purpose, the Gasco City News does not purpose to be altogether solemn. As a matter of fact, with deliberate intent, the presentation of its news will be tinged with considerable levity, in so far as the somewhat spavined and totally disillusioned editor is able to tinge it. Liberties will be taken with the dignity and peace of mind of high officials of our organization, who, thank Heaven, are the kind of officials who will enjoy it fully as much as any other employee.

"But there is a great deal of difference between solemnity and seriousness of purpose. And while The Gasco City News will not be solemn, its purpose is, and will be, altogether serious—the achievement of building Gasco City is none the less a challenging task because it will not be an actual geographical spot on the map you can put your finger on. As far as our organization is concerned, it is stark realism. When we are successful, we actually will have added to our system service equivalent in size to a city of the importance of Valdosta, Anniston or Pensacola with no outlay for mains or plants. This will be a splendid thing and the benefits of this tremendously increased service will be participated in by every property contributing to the building of it.

"If the Editor doesn't get shot in the meantime, there will be an issue of The News every week during the campaign. We hope it will be helpful, and we will try to make it readable. From now on, Gasco City will be a real city as far as The News is concerned, and will be written about as such.

"And The News itself will be the newspaper of Gasco City, edited and published in Gasco City, and devoted entirely to its upbuilding. There is no reason, the Editor believes, why it should not be amusing as well as helpful. But to be most helpful, it should be read in the spirit that it is written. Gasco City is partially an illusion, it is true. But the importance of this campaign is far from being an illusion. Gasco City is based upon the most solid fact, essentially.

"Therefore, if The News should set off a firecracker under the dignity of some official, enjoy it, but not too much. The next one might go off under you."

"The Greater Gasco City News," which was introduced on February 1, is a six-column, four-page newspaper, with news, editorial, advertising and other departments treated in the style reflected by the daily press.

It is a welcome addition to the ranks of the gas industry's house publications, and its readers undoubtedly will extend far beyond the employees of the Atlanta Gas Light Company.

University of Pittsburgh Establishes Natural Gas Laboratory

THE School of Mines of the University of Pittsburgh has established, with the cooperation of the Pennsylvania Natural Gas Men's Association, a new laboratory for instruction and research in natural gas engineering. Chancellor Bowman, of the University, designated a large room 35 feet by 55 feet, situated on the ground floor of the new Cathedral of Learning, for permanent use as the Natural Gas Laboratory. Heat, water, gas and other facilities have been provided. This is the first engineering laboratory to be established in the new Cathedral of Learning.

Natural gas companies of Pennsylvania which comprise the Natural Gas Men's Association and including the People's Natural Gas Company, the Equitable Gas Company, and the Manufacturers' Light and Heat Company have donated to the University complete equipment for the laboratory. J. W. Brown, of Pittsburgh, a former student of the University, has given a motor-driven compressor unit. In a short time, the School of Mines will have in operation one of the most complete natural gas laboratories in the country.

The laboratory will be under the supervision of Professor H. C. George, head of the Oil and Gas Department of the University, who came to Pittsburgh last fall from the University of Oklahoma where he had been Director of the School of Petroleum Engineering.

Decision to enter into natural gas engineering was made after consultation with the Oil and Gas Advisory Committee of the University, consisting of Dr. J. French Robinson, vice-president of the People's Natural Gas Company; Dr. Paul D. Foote, executive vice-president, Gulf Research and Development Corporation; Dr. K. C. Heald, chief geologist, the Gulf Companies; Dr. William Hamor, assistant director of Mellon Institute of Industrial Research; Ralph E. Davis, consulting petroleum and natural gas engineer; E. L. Esterbrook, petroleum engineer, Standard Oil Company of New Jersey, and C. V. Millikan, chief petroleum engineer, Amerada Petroleum Corporation.

A complete four-year curriculum in natural gas engineering as a third option in the Oil and Gas Department, has been outlined by Professor George and next fall, freshmen will be admitted to the new course. Research work in natural gas engineering will be started immediately.

BOOK REVIEW

The Saturation of Electric and Gas Appliances. By Erich Schäfer. Published by C. E. Poeschel Verlag, Stuttgart, Germany. Eighty-three pages with 27 tables and 34 charts. Price, 5.80 Reichsmark plus postage.

This work represents a statistical study of the saturation of Gas and Electric Appliances in a large Metropolitan City. It is a new high point in statistical study of saturation and brings forth very detailed studies and definite conclusions about the saturation of the different appliances according to two bases. One the percentage the Utility Company serves and second according to the purchasing power of the Customer.

The data was obtained by collaboration with the Berliner Elektrizitätswerke A. G. (BEWAG) and the Berliner Städtische Gaswerke A. G. (GASAG), and consequently to that extent represents an accurate measure of the appliances in use.

The mere fact that the Analysis is of Berlin does not in any way affect the value of the material, as this serves only as a means for bringing to the front methods for making this most complete study. Having been carried out by a Statistician it is free from the prejudices which would be worked into such an analysis by the Commercial, Utilization or Engineering Departments of a Utility Company.

On the other hand this is one of the greatest disadvantages in that the work is incomplete and the logical conclusions of commercial activity to further saturate the market are likely not to be carried on.

It would be worthwhile for New Business Departments to study the methods used in this Market Analysis and from that point determine to what extent they can bring to the customer the advantage of appliances which are shown to be bought only as a result of purchasing power and obtain from these appliances the added load and increased load factor.

—A. M. APMANN.

ACCOUNTING SECTION

E. B. NUTT, Chairman H. W. HARTMAN, Secretary A. S. CORSON, Vice-Chairman

Balance Sheet Consolidation by Machine*

By W. S. Bowser

The Koppers Company

THE time-honored method of balance sheet consolidation by copying balance sheets onto a columnar form, adding across, entering eliminations in a column, and finally arriving at the consolidated figures, has seen its day. Spread sheets are messy, require a lot of time, lack flexibility and defer the real work until the last moment when time is most valuable.

Quite often the elimination column turns into a puzzle when a number of entries affect the same account. It then either becomes cluttered up with brackets or resembles an attempt to squeeze a column of figures into one line. Furthermore, the spread-sheet method requires the use of high-grade accounting talent; when, as a matter of fact a lot of the work is merely copying and adding.

A machine method of consolidating balance sheets, on the other hand, results in a neat record, one which can be prepared by less expensive employees. It provides flexibility, eliminates the peak at the closing, and promotes accuracy. Consolidation work is a real problem in any company having a large number of subsidiaries, especially if it is addicted to the old-fashioned spread-sheet method. Machines on the other hand will make the problem a simple one, a matter of mere routine.

The machine method described hereafter is not imaginary. It has been used successfully for several years and has fully justified its installation. Therefore, it can be recommended to any company which has an extensive volume of consolidation work and enough excess machine capacity to care for the work during the period of the month when this task must be done. Then too, it may pay, where there is no excess machine capacity, to install an extra machine to provide the capacity necessary for this work and any emergencies which may arise.

The installation of the system has the following requisites:

a. Application of a number to each consolidation.
b. Application of numbers to all balance sheets.
c. Standardization of balance sheets.
d. Opening of consolidation ledgers.
e. Establishment of procedure.

* Contribution from the Accounting Machines Committee.

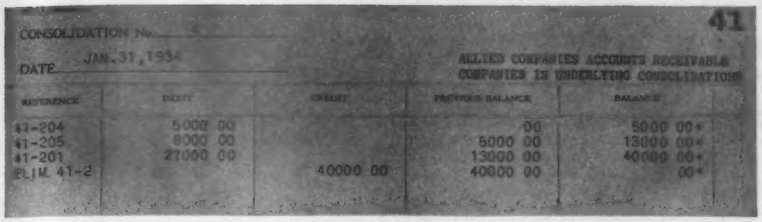
COMPARATIVE BALANCE SHEET

..... January 31, 1934 Cons. No. 2 Co. No.....
(Name of Company)

ASSETS	January 1934	December 1933
PROPERTY AND EQUIPMENT (Exhibit "A")		
(1) Plant and Equipment	$50,000.00	
(2) *LESS*: Property Retirements and Deductions		
(6) APPROPRIATIONS–(Schedule 1)		
Approved		
Pending		
(11) INVESTMENTS—ALLIED COMPANIES	$10,000.00	
(12) INVESTMENTS—OUTSIDE COMPANIES (Exhibit "B")		
(20) FUNDS HELD BY TRUSTEE		
CURRENT ASSETS		
(25) Cash	$5,000.00	
(25) Call Loans		
(26) Notes Receivable (Schedule 2)		
(27) Accounts Receivable (Schedule 3)	25,000.00	
(28) Accounts Receivable—Affiliated Companies (Exhibit "C")		
( )		
(29) Prepaid and Suspended Accounts (Schedule 4)	1,000.00	
(30) Inventories (Schedule 5)	14,000.00	
(31) Work in Progress		
	$45,000.00	
(40)		
(41) ALLIED COMPANIES ACCOUNTS RECEIVABLE (Exhibit "C")	$5,000.00	
(42)		
(43)		
SPECIAL ACCOUNTS		
(50) Unamortized Debt Discount and Expense		
(51) Organization and Preliminary Expense		
TOTAL ASSETS	$110,000.00	

LIABILITIES			January 1934	December 1933
CAPITAL STOCK	Authorized	Issued		
115 Common No Par	500 Shs.	500 Shs.	$50,000.00	
(125) TERM INDEBTEDNESS (Exhibit "D")				
CURRENT LIABILITIES				
(130) Notes Payable (Exhibit "D")				
(131) Accounts Payable (Schedule 6)			$5,000.00	
(132) Accounts Payable—Affiliated Companies (Exhibit "C")				
( )				
(134) Accrued Payroll				
(135) Accrued Taxes (Schedule 7)				
(138) Accrued Federal Income Tax				
(136) Accrued Interest				
(137) Other Current and Accrued Accounts (Schedule 8)				
			$5,000.00	
(140) DIVIDENDS PAYABLE			$2,000.00	
(145)				
(146)				
(147) ALLIED COMPANIES ACCOUNTS PAYABLE (Exhibit "C")				
(148)				
RESERVES				
(150) For Depreciation			$4,000.00	
(151) For Depletion				
(152) For Oven Relining				
(153) For Amortization				
(154) For Workmen's Compensation Insurance			4,000.00	
( ) For				
(158) For Federal Income Tax Deficiencies				
(166) For Other Purposes				
			$8,000.00	
(170) WORK IN PROGRESS—CONTRACTS UNDERWAY				
(179) CAPITAL SURPLUS				
SURPLUS				
(180) Surplus as of January 1st.			$40,000.00	
(182) Profit—Loss to First of Month			5,000.00	
(183) Profit—Loss for Month				
			$45,000.00	
TOTAL LIABILITIES			$110,000.00	

Exhibit "A"



CONSOLIDATION No. 41

DATE JAN. 31, 1934

ALLIED COMPANIES ACCOUNTS RECEIVABLE
COMPANIES IN UNDERLYING CONSOLIDATIONS

REFERENCE	DEBIT	CREDIT	PREVIOUS BALANCE	BALANCE
41-204	5000 00		00	5000 00+
41-205	8000 00		5000 00	13000 00+
41-201	27000 00		13000 00	40000 00+
FLIM. 41-2		40000 00	40000 00	00+

Exhibit "B"

Consolidation Numbers

Each consolidation, whether major or underlying, should be given a distinctive number. For example, if there are twenty different consolidations to be made, they may be numbered from one to twenty. The proper consolidation number should then be entered on each balance sheet so that the machine operator will know which ledger it should be posted to.

Balance Sheet Numbers

The balance sheet coding is for the most part a numbering of each company. Balance sheet numbers too should not only be descriptive of the company itself, but also of the consolidation. Therefore, the balance sheets can be numbered from one to ninety-nine in each consolidation, with the consolidation number as the hundred digit. Thus balance sheet No. 201 not only distinguishes the company, but also that it belongs to consolidation No. 2. Each underlying holding company will have two numbers, one for the balance sheet of the company itself, and one for its consolidated balance sheet. Thus an underlying holding company balance sheet might be numbered 301; for example, showing that it heads consolidation No. 3. The consolidated balance sheet of this company, however, may enter into consolidation No. 2, and therefore should be given a number in the 200 series.

Balance sheet numbers should be shown on all balance sheets sent to the machines for posting on the consolidation ledgers.

Standardization of Balance Sheets

If individual companies are permitted to submit balance sheets containing asset and liability titles of their own choosing, there is little use in attempting to consolidate by machine. Therefore, the balance sheets of all companies must be standardized and each title numbered to provide an account number for the consolidation ledgers.

Exhibit "A" illustrates a standard balance sheet used in machine consolidation. It will be noted that space is provided for the consolidation number and company or balance sheet number; also, that the title numbers are printed on the form.

By carrying this balance sheet title number a step farther, it will be found convenient to code general ledgers accounts with these basic numbers. For example, it may be found desirable to have several accued taxes accounts in the general ledger. Nevertheless these may all be numbered with the basic balance sheet number and a suffix—1,—2,—3, etc., *ad infinitum*. These would be grouped on the balance sheet.

In this way the management may control the preparation of balance sheets and leave nothing to the judgment of the bookkeeper who enters the balance sheet from the trial balance. The number of the account determines its exact description in the financial statement.

Consolidation Ledgers

Ledger forms similar to that illustrated on Exhibit "B" should be printed on machine ledger stock. One sheet for each balance sheet account should be prepared for each consolidation. Each consolidation will then have a ledger to which the balance sheets should be posted.

After all of the balance sheets and eliminating entries are posted to a particular consolidation ledger, the consolidated balance sheet may be prepared by simply copying the balances of each account into the proper title on the standard form.

Procedure

The procedure is comparatively simple in so far as the ledger posting is concerned. The machine simply posts all assets as debits and liabilities as credits and enters the new balance after each posting. The machine should accumulate debit and credit postings in separate registers, which should balance after each balance sheet is completed. Furthermore, both registers should show the same total as the balance sheet itself.

The auditing department will want to know, however, that all postings have been made to the proper account of the proper ledger. To check the machine work, a proof sheet or tally on which the postings are recorded should be returned to the auditors with the balance sheet.

The machine operator should enter as a reference to each posting not only the balance sheet number from which the posting was taken, but also the number of the account printed on the balance sheet. This reference then appears on the proof sheet, which should be checked to the balance sheet.

By checking the tally (see Exhibit "C") to the balance sheet (Exhibit "A"), we have proven that the operator has posted the proper amounts and has used the proper reference. We have not proven that the entry was actually made on the proper ledger sheet nor that the entire balance sheet was not posted to an improper ledger.

Such errors are not likely to happen, but if they do occur they should be caught by the person who takes off the consolidated balance sheet. As he takes off the figures he should check the account numbers in the reference column with the account number on the ledger sheet. He should also see that the balance sheet numbers in the reference column are consistent with the consolidation ledger number.

For example, if a reference 6-201 appears on ledger account No. 1 of consolidation No. 2, it is plain that the operator posted to the wrong account or used the wrong reference. If the reference was incorrect it should have been caught when the tally was checked to the balance sheet. Apparently then the operator used the wrong ledger sheet.

Or, if a reference 41-206 should appear on ledger account No. 41 of consolidation No. 1, it would be apparent that either the reference was incorrect or the posting was made to the wrong ledger entirely. Evidently the entire balance sheet would have to be posted to the wrong ledger or the ledger would not balance.

Therefore, if the proof sheets are checked back to the balance sheets and all references are consistent with the accounts and ledgers to which they are posted and the consolidated figures balance, the accuracy of the work may be accepted.

No system of proof of old balance pick up is necessary, because the adding of the two sides of the consolidated balance sheet will prove that no such error was made. Such an error if it should occur can easily be located by a glance at the ledger.

Eliminating Entries

Proper eliminations are, of course, the most important feature of balance sheet consolidations. Detailed schedules of all inter-company accounts; such as, "Receivables" and "Payables" should accompany each balance sheet. These schedules must then be reconciled with the schedules of other affiliates in order to obtain the proper eliminations.

Making a rule that no inter-company accounts shall be paid at or near the end of any month will avoid the closing of a "Payable" by one company in a month prior to that in which the creditor can credit the "Receivable" account. Further-

(Continued on page 106)

CONS 2 ASSETS 1/16/34

***		
1-204	50000 00	
11-204	10000 00	
25-204	5000 00	
27-204	25000 00	
29-204	1000 00	
30-204	14000 00	
41-204	5000 00	
204 ASSETS	110000 00*	
LIAB.***		
115-204		50000 00
131-204		5000 00
140-204		2000 00
150-204		4000 00
154-204		4000 00
180-204		40000 00
183-204		5000 00
204 LIAB.		110000 00

Exhibit "C"

HOME SERVICE COMMITTEE

DOROTHY E. SHANK, Chairman — JESSIE McQUEEN, Secretary

New England Directors Hold Meeting

A HOME service luncheon, with an attendance of sixty, was one of the features of the New England Gas Association Convention, held in Boston, Mass., February 8 and 9. In the absence of the chairman, Mrs. Leonora Pendergast, of the Lowell Gas Light Company, who was ill, Mrs. Carolyn Bixby, past chairman of the group, presided.

Greetings and encouragement were extended by F. M. Goodwin, of the Boston Consolidated Gas Company, incoming president of the Association; H. R. Sterrett, of the New Haven Gas Light Company, president, and H. B. Hall, of the Old Colony Gas Company, who is chairman of the sales division of the association.

Dorothy Shank, chairman of the A. G. A. Home Service Committee, in her remarks outlined the program of work for her committee this year. She mentioned particularly the activities of the three representatives of New England on the Home Service Committee—Mrs. Cornelia Newton, of the New Haven Gas Light Company, representing the New England Gas Association; Miss Ruth Feeney, of the Boston Consolidated Gas Company, and R. J. Rutherford of the New England Gas and Electric Association, in Cambridge.

Following the luncheon an interesting program was given, consisting of eight-minute talks by six salesmanagers of New England. J. J. Quinn, of Boston, presented facts and figures as the result of a survey among customers, which indicated that a big job still faces home service departments. Roger A. Gordon, of Pawtucket, R. I., wondered why home service had not grown more rapidly. He felt that there was still need of a definite yard stick, so that home service could get greater support. He presented a criticism, which he had often heard, that home service directors were not well enough informed on all activities of the company. He suggested that if home service were under way in a company, that there should be one director for at least every 5,000 customers; that she be assigned definitely to that district, and that if it were a foreign district, that the home service director should be able to speak that foreign language.

John F. Tully, of Brockton, Mass., stated the value of home service in follow-up calls, and he felt that one characteristic necessary for a home service worker is that she must have tact and be able to "size-up" each and every situation when she arrives at the home, and then adapt her own information to the actual home needs of the individual customer.

A Successful Plan

Taylor C. Harvey, of Manchester, New Hampshire, outlined the activities of his home service department in covering a territory of widely separated small towns, varying from 70 to 4500 gas meters. He brought out the encouraging figure that home service had cost much less than was anticipated in the beginning. Mr. Harvey outlined in detail an interesting plan that his company felt best fitted to its situation, this being individual classes for women who actually conducted their own demonstrations.

One woman in each community was allowed the privilege of inviting ten of her friends, who paid a certain fee each week for the ingredients used, and then were taught, in a series of ten lessons, how to prepare their requested food items on modern gas equipment. Seven hundred women so far have been graduated from these classes, and the only cost to the company has been the time of the home service girl, and a slight depreciation on the equipment used. This method of giving lessons has brought together women who are friendly with each other, working in an atmosphere of serious study, therefore accomplishing good results.

William M. Walsh, of the Connecticut Light & Power Company, mentioned the varied activities being considered through his company's properties by the home service departments. He stated that they had increased their staff 50 per cent in the last two years. Among the activities mentioned were:

The use of home demonstrations where women were invited to bring in their friends for a short demonstration in the home; assistance with the trade dealer program under the "Connecticut Merchandising Principles" plan; demonstrations before organizations of women's clubs; home service demonstrations to meetings of employee groups; and now a kitchen planning project is under way.

Mr. Walsh brought out the fact that all their home service workers were well-informed on the rates and policies of the company, so that they could answer a customer's questions on these subjects. In planning their work, Mr. Walsh said that their program was always altered whenever a change was needed, in order to meet the most immediate needs of their communities.

Jesse L. Johnson, of Providence, emphasized an ever-current need of home service—that of finding indirect means where home service can help sales. He felt that no company should overlook the advantages of cooking schools, where women could actually see food prepared, and good results obtained from modern gas equipment, in an attractive setting. Mr. Johnson described the new floor kitchen containing modern appliances, which is attracting much customer-attention.

725 Home Service Workers

Jessie McQueen, home service counsellor of the American Gas Association, in presenting the 1934 listing of home service directors, called attention to the fact that with 370 home service departments now active throughout the United States, and a total of 725 women doing home service work, that home service had reached its greatest number reported so far.

She mentioned that in New England there had been an increase of four departments reported, now being sixty-one in all. As far as percentage was concerned, the New England departments constituted 17 per cent of the total number of home service departments in the country. With the ninety-eight women doing home service work in New England, this percentage constituted 12 percent of the total number of home service women.

Miss McQueen stated that the "Home Service News" was the official publication of the A. G. A. which was sent to these departments every two months, and she asked for assistance from the New England directors in sending in news items regarding their activities, which could be included in the "News Letter," in order to make it really indicative of the work throughout the country.

Officers of the New England home service group elected for 1934 were: Mrs. Lyda Flanders, Worcester Gas Light Company, chairman; Miss Delphine Lerschen, Public Service Company of New Hampshire, vice-chairman, and Miss Lola Cromwell, Old Colony Gas Company, secretary-treasurer.

Course at N. Y. U.

THE Home Economics Department of New York University, under the direction of Dr. Frieda J. Winning, will present, again this Spring, a course of ten weeks' duration on gas and electric equipment. The course will be given on Fridays at 4:15 and the program is as follows:

March 2, (a) Gas Ranges and Thermostatic Controls. T. H. Schleuning, Service Engineer, Consolidated Gas Company of New York; (b) Oven Heat Distribution, Miss Ruth Soule, Director, Home Service Division, Brooklyn Union Gas Company. Place: College.

March 9, (a) Gas Refrigeration. W. S. Walker, Engineer of Utilization, Consolidated Gas Company of New York; (b) Water Heating and Laundry. Mr. H. E. Haby, Laboratory Supt., Consolidated Gas Company of New York. Place:—Home Service Auditorium, Consolidated Gas Company of New York.

March 16, (a) House Heating—Gas, Oil, Coal. Frank Hearty, Manager, House Heating Division, Brooklyn Union Gas Company; (b) Heat Controls. E. C. Rieger, Assistant Manager, Minneapolis Honeywell Regulator Co.; (c) Air Conditioning. E. D. Milener, Research Engineer, American Gas Association. Place:—College.

March 23, Cabinets and Sinks for the Modern Household. (a) Miss Isabella B. Hussey, Secretary and Treasurer, Janes and Kirtland Inc.; (b) Mrs. Dorothy McGeehan, Home Economist, International Nickel Company. Place:—Janes and Kirtland Inc., showrooms 101 Park Avenue.

April 6, (a) Table China—Its Production, Selection, and Use. Frank G. Holmes, Secretary and Designer of Lenox Inc.; (b) Glassware for the Modern Home. Miss Lucy Maltby, Home Economics Adviser, Corning Glass Works. Place:—College.

April 13, (a) Selection of Cutlery. Kenneth S. McIntyre, Landers, Frary and Clark; (b) Selection of Cooking Utensils. Robert N. Caird, Landers, Frary and Clark. Place:—Landers, Frary and Clark Showrooms, 200 Fifth Avenue.

April 20, Use of Electricity in the Home. Miss Marie Reith, Director of Home Service, The Edison Company of New York. Place:—To be announced.

April 27, Lighting the Modern Home. Miss Lillian Eddy, Home Lighting Specialist, Atlantic Division Incandescent Lamp Department, General Electric Co. Place:—Electrical Association of New York, Grand Central Palace.

May 4, Cleaning and Laundering By Electricity. Mildred A. Nichols, Director of Home Economics, Graybar Electric Company, Inc. Place:—Graybar Electric Company, Inc., 420 Lexington Avenue.

May 11, Cooking by Electricity. Miss Florence Frear, Director of Home Economics, Brooklyn Edison Company, Inc. Place:—The Brooklyn Edison Company, Inc., 380 Pearl Street, Brooklyn, New York.

May 18, Electric Refrigeration. Mrs. M. F. Waite, Assistant Manager of Home Economics Department, and J. Welsh, Manager of Refrigeration Bureau, The Edison Company of New York. Place:—To be announced.

Home Service on Convention Programs

MISS ELIZABETH SWEENEY, of the Empire Gas & Electric Company, Geneva, New York, presented a paper at the Eastern Natural Gas Sales Conference on February 9 in Pittsburgh, Pa. The subject was "Customer Reaction From The Home Service Viewpoint."

In this paper Miss Sweeney brought out as illustration the value of such home service activities as home call work, class demonstrations, demonstrations in homes, and trade dealer cooperation; all excellent ways of furnishing utility service in the home, and through that means, a way of finding out how the customer actually regards her contacts with the utility company.

At the annual distribution conference, to be held this year in Detroit, April 9 and 10, Miss Hulda Ungericht, of the Ohio Fuel Gas Company, Columbus, will present a paper on "Customer Service,"—bringing out the increased service to customers that is possible by making full use of the home service department in connection with the other servicing problems of the utility company.

Home Service Conference

THE Home Service Committee of the American Gas Association, whose Chairman is Dorothy Shank, will hold its annual two-day conference in Chicago this year on Friday and Saturday, April 13 and 14.

The program of the course will consist of talks on domestic equipment, giving facts of particular interest to home service people, service men, and others interested. The program also will include a review of modern trends in home service activities.

Detailed announcements will be sent to the industry in a short time.

The Gas Industry Today

(Continued from page 75)

if they disagreed, they threw down their shields and stuck their spears into the ground, and the king was bound by their answer.

The Anglo-Saxons' institution of marriage was well developed, and their attitude toward their women was already fixed. They believed in a high degree of personal honor—to them, their word was sacred. Out of that grew their sacredness of contract and the development of the law merchant. In fact, when they first emerged into civilization they had all the rudiments of our present institutions and laws, and the general stream of their growth has constantly flowed along these same channels.

There have been times when the race has been led astray by propaganda of one kind or another, and people have fought wars which they had not properly considered before entering them. They have gotten off the right track now and again, but always they have come back to those original sentiments and traditions, and I think we can feel reasonably sure that when the country has returned to normal, the Anglo-Saxon tradition of government which has remained with us throughout all these centuries will again predominate, and whatever changes may be effected will conform to those general sentiments and traditions.

The Anglo-Saxon has developed through his love of personal liberty. In all his governments he has striven to maintain that liberty, together with the right of the individual to exercise his private initiative and receive the rewards thereof. It was with the view of perpetuating those rights that this continent was settled, that the Revolution was fought, that the Constitution was adopted and our present form of government established; and when the depression is over and the sunshine of prosperity is to be seen again, our government will function in accordance with those great traditions.

Ours is a government of institutions and laws, and not a government of men, and I for one do not believe that it will ever become a government of men. I think it was Plato who said, "Time and silence solve most questions and cure most ills."

Chance of Finding Gas Deposits in Iowa Remote

EXPECTATIONS of finding natural gas in Iowa have been blasted by Dean George F. Kay, state geologist connected with the University of Iowa, following reports of natural gas discoveries near Des Moines. He said that the chances of discovering any deposit which might be developed on a commercial scale are very remote.

"In every case reported to me thus far, the gas was found to be contained in comparatively small pockets in sand and gravel above the solid rock," he asserted. "These pockets of natural gas are formed by the distillation of organic material which settled during the glacial period."

At the greatest cost and of the least value is that which you gain at another's expense.

MANUFACTURERS' SECTION

JOHN A. FRY, Chairman J. SCOTT FOWLER, Vice-Chairman C. W. BERGHORN, Secretary MERRILL N. DAVIS, Vice-Chairman

The Fox Furnace Company In Business Half-Century

FIFTY years ago, F. B. Fox, who previously had been the agent for the Richmond Stove Company, organized The Fox Furnace Company. The new industry was started at Cleveland, Ohio, and for the next decade Mr. Fox guided its destinies and saw that a firm and lasting foundation was laid.

In 1894 Henry Wick purchased the young company and assumed its management, with Ernest C. Fox, son of the founder, continuing his association with the organization for some time thereafter. The latter as proprietor of the Independent Register Company, Cleveland, has continued his activities in the air heating field and is well known throughout the industry.

At the turn of the Century, a site for a new factory was selected in Elyria, twenty-five miles west of Cleveland. The factory and foundry building erected there had a floor area of approximately 37,000 square feet. New buildings and additions, necessitated by the expansion of the business today occupy an area of approximately twenty-five acres.

The American Radiator Comany purchased control of The Fox Furnace Company in 1923. At that time the manufacture of heating stoves and ranges was stopped. Production henceforth was concentrated on air heating equipment. The products now consist of cast iron and boiler plate furnaces; gas furnaces; and residential air conditioning units for all fuels.

General Electric Adds Line of Gas Furnaces

THE General Electric Company last month announced a line of gas furnaces, supplementing its oil furnace placed on the market a year ago. The gas furnace will be a coordinated unit with burner, boiler, control and all parts enclosed in a single jacket of distinctive appearance, and G. E. air conditioning dealers throughout the country will be ready to make installations this spring. In addition to the dealers now handling G. E. oil furnaces and air conditioning equipment, new dealers are now being appointed in territories not covered and where natural gas is easily available.

To provide a central location for shipping and to be near the natural gas territory, the new furnaces will be manufactured in Cleveland, O. A factory has already been equipped and production is under way. The first showing of the new furnace was at the Heating and Ventilating Exposition, New York, last month.

In commenting on the new gas furnace, J. J. Donovan, manager of General Electric's air conditioning department, said:

"Various sizes of gas furnaces will be available for residential, commercial and small industrial applications, and also for large quantities of hot water. The G. E. gas furnace will also be interchangeable with the G. E. oil furnace as part of the G. E. air conditioning system. Each dealer will have factory trained engineers for servicing and installations. The air conditioning department of the company and the G. E. air conditioning dealers will cooperate with gas utilities in promoting the gas furnace."

H. B. Smith is in charge of the gas furnace sales activities, with offices in New York City. Mr. Smith, who will work with district sales representatives, dealers and gas utilities in sales supervision and training, has had several years of experience in the promotion of gas heating, with the Consolidated Gas Company of New York and with the Central Hudson Gas and Electric Company, Poughkeepsie, N. Y.

Appliance Testing and Laboratory Operations

(Continued from page 79)

which can yet be made in such fields, should assist eventually in lowering rates for domestic consumption and further fortifying the position of our product in the field of competitive fuels.

Future Developments

A survey of our situation indicates that developments in the immediate future will probably be confined more to the perfection and modernization of present types of equipment, rather than to the invention of new ones. This situation will doubtless be brought about largely by the application of many new devices to existing appliances, particularly those which will convert manual equipment to automatic control. Obviously, such efforts should add greatly to the safety and convenience of gas appliances and increase their desirability from the user's viewpoint, although it should be understood that the engineering problems involved in such conversions will represent no small task. Following this period, and to a certain extent coincident with it, should come the development of many new types of equipment, increasing the use of gas. It is predicted that the next ten years will represent what history will later record as a turning point in our industry's affairs.

In conclusion, our industry's position in the field of competitive fuels even now seems very encouraging. We possess the fundamental advantage of being able to offer a constant supply of energy to our consumers in the form of gas at almost any point desired within the limits of our distribution systems generally at a lower unit cost than any other form of fuel possessing comparable convenience features. No other available form of energy possesses so many desirable characteristics excepting electricity, and apparently we will be able, at least for many years to come, to supply energy in the form of heat at a considerably lower unit cost than will this particular competitor. Hence, it is evident that the economic position of our industry is inherently sound. Granted a reasonable amount of sales promotion and unnecessary political interference, our business should continue to prosper and increase its usefulness to the American people.

Considering the nature of my audience and recent national developments, I offer in closing an ode to gas lighting, written by Robert Louis Stevenson, and first presented, as far as I know, before an audience of gas men in Santa Barbara, California, in 1922, by that sage of the Pacific Coast Gas Association, Charley Babcock. It follows:

But where soft joys prevail
Where people are convoked to pleasure
And the philosopher looks on smiling and silent
Where love and laughter and deifying wines abound
There, at least, let the old mild luster
Shine upon the ways of man.

TECHNICAL SECTION

O. S. HAGERMAN, Chairman H. W. HARTMAN, Secretary C. A. HARRISON, Vice-Chairman

1934 Distribution Conference Program To Stress Economy and Service

TEN years ago, in Toronto, Canada, J. D. von Maur, engineer of distribution of the Consumers Gas Company, Toronto, conceived and organized the first A. G. A. Distribution Conference. Only thirty-three distribution engineers attended the first conference, but this representation, while small in numbers, had from the beginning the characteristic of representing a wide geographic spread including one representative from the Pacific Coast—W. M. Henderson.

As an indication of the growth of these conferences, there is reproduced herewith a picture of the 1933 Distribution Conference held at the William Penn Hotel, Pittsburgh, Pa., last April. That the success of these Conferences has been largely due to the practicability of their original conception is shown by the fact that they have become increasingly well-attended without any change in the general plan of organization.

Each year their program has been built on the principle of confining all presentations and discussions to the outstanding problems met each day in the distribution of gas. The entire field is largely covered each year and there has been no attempt to introduce speakers outside of the industry nor subjects other than those in which the distribution engineer himself is vitally interested. No proceedings are published, and a strong effort is made to impress the distribution engineer with the value of his personal attendance at the Conference in order to obtain the benefit of an intimate discussion of his problems with men who are meeting the same problems in other cities.

In recent years, it has been the practice to develop the program of the Distribution Conference well in advance of the year in which it is held in order that the fullest consideration may be had in selecting the subjects to be discussed.

The Program Committee this year began its work immediately after the 1933 Distribution Conference, and in presenting the program which has been selected it is felt that the distribution engineer will appreciate the thought and study that the Committee has devoted to this subject.

TENTATIVE PROGRAM

A. G. A. DISTRIBUTION CONFERENCE

Book-Cadillac Hotel

Detroit, Mich.

April 9-10, 1934

Monday, April 9—10:00 A.M.

Opening Remarks
H. W. Battin, Chairman,
Distribution Committee,
Philadelphia, Pa.

Greetings
Alexander Forward, Managing Director,
American Gas Association.

Welcome to Detroit
J. W. Batten, V. P. & Genl. Mgr.,
Detroit City Gas Co.,
Detroit, Mich.

Paper: The Distribution Office
H. A. Anderson,
Syracuse Lighting Co.,
Syracuse, N. Y.

Paper: Work on Consumers' Premises
C. E. Muehlberg,
Consolidated Gas Co. of New York,
New York, N. Y.

2:00 P.M.

Paper: Maintaining Installations
R. H. Taylor,
Public Service Company of Colorado,
Denver, Colo.

Address: What About the Distribution Engineer?
C. N. Chubb,
American Light & Traction Co.,
Chicago, Ill.

Paper: Removing and Resetting Meters and Turn On and Off Expense
H. L. Gaidry,
New Orleans Public Service, Inc.,
New Orleans, La.

Paper: Connecting Ranges, Water Heaters, Refrigerators and House Heaters
H. D. Lehman,
Philadelphia Gas Works Co.,
Philadelphia, Pa.

Paper: Storeroom Operation and Its Inter-Related Activities in the Gas Industry
A. I. Snyder,
Detroit City Gas Co.,
Detroit, Mich.

Tuesday, April 10—9:30 A.M.

Paper: Organization and Operation of Numerous Distributing Systems Scattered over Wide Areas
Chester L. May,
Community Natural Gas Co.,
Dallas, Texas.

Distribution Conference in session at Pittsburgh, Pa., April, 1933

Paper: Satisfying the Customer
Hulda Ungericht,
Ohio Fuel Gas Co.,
Columbus, Ohio.

Paper: Consolidation of Shops
H. B. Andersen,
Philadelphia Gas Works Co.,
Philadelphia, Pa.

OPEN FORUM

2:00 P. M.

Report: Subcommittee on Meters and Metering
L. H. East, Chairman,
Rochester Gas & Electric Corp.,
Rochester, N. Y.

Report: Subcommittee on Pipe Coatings and Corrosion
George H. Boyd, Chairman,
Consolidated Gas Co. of New York,
New York, N. Y.

Report: Corrosion Survey for Pipe Lines and Distribution Systems
Dr. Scott Ewing, Research Associate,
U. S. Bureau of Standards,
Washington, D. C.

Report: Subcommittee on Pipe Joints
C. H. Waring, Chairman,
Kansas City Gas Co.,
Kansas City, Mo.

Paper: Corrosion of Bolts on Pipe Joints
J. A. Perry,
The United Gas Improvement Co.,
Philadelphia, Pa.

Paper: The Distribution of Gasket Pressures in Pipe Joints and Clamps
George H. Pfefferle,
S. R. Dresser Manufacturing Co.,
Bradford, Pa.

Report: Subcommittee on Cast Iron Pipe Standards
C. C. Simpson, Chairman,
Consolidated Gas Co. of New York,
New York, N. Y.

Closing Remarks: Tenth Anniversary of the Distribution Conference—Its Accomplishments
J. D. von Maur,
Consumers Gas Co. of Toronto,
Toronto, Ont., Canada.

As reported last month, the above program is primarily designed to bring out economies actually achieved in the distribution of gas, the subjects being classified in accordance with the account classification for distribution work in the Uniform Classification of Accounts. As so much of this work is directly related to service to the consumer, it seemed particularly appropriate to the Distribution Committee to obtain the point of view of the home service director whose contacts with the consumers give such a valuable index as to the degree of satisfaction the consumer feels in regard to such service. The committee has been most fortunate in securing the assistance of Miss Hulda Ungericht, home service director of the Ohio Fuel Gas Company, in presenting this point of view.

Another feature of the program will be a complete progress report on the research being conducted on pipe coatings and corrosion which will include a complete report on services as well as mains. The Subcommittee on Pipe Joints, in addition to their regular report, will have an interesting presentation by J. A. Perry on the results of research on corrosion of bolts on mechanical joints, as well as a paper to be submitted by George H. Pfefferle, chief engineer of the S. R. Dresser Manufacturing Company, on "The Distribution of Gasket Pressures in Pipe Joints and Clamps."

J. D. von Maur, founder of the Distribution Conferences, has most kindly consented to present a review of the accomplishments of the Conferences since their inception in Toronto in 1924.

Notice will be sent to all company members giving full information in regard to arrangements for the Conference, hotel reservations, registration routine, reduced fare certificates, etc. This will be sent to company delegates, but additional copies may be obtained upon request to Association Headquarters.

Don't fail to make a note now that the 1934 Distribution Conference will be held at the Book-Cadillac Hotel, Detroit, Mich., April 9 and 10, 1934. You will be well repaid for your attendance.

Laboratory Studies of the Performance of Pipe Coatings

By Scott Ewing*

Research Associate, American Gas Association

I. Summary

SOON after the field tests of protective coatings were started under the sponsorship of the American Gas Association, laboratory tests were undertaken for the purpose of studying in some detail the progress of coating deterioration with the end in view of developing a method for testing coatings which would be more rapid than the field tests. These tests included, among others, the periodic determination of the electrical conductance of the coatings while they were exposed to the action of (1) salt water and (2) soil which was alternately wet and dry. The tests were continued over a long period of time so that the degree of protection afforded could be estimated from the final condition of the pipes. It was also possible to compare the results of the laboratory tests with those of the field tests. The present report gives a description of the two types of test and the results obtained. The time variation of the electrical conductances of these typical coatings over a long period should be of considerable interest to those who are using cathodic protection on coated pipe lines. It appears that two important factors in estimating the protective value of pipe coatings are moisture penetration and the mechanical effect of the soil.

II. Methods of Test

A. Salt Water Tests

A description of the coatings in this test is given as an appendix to the 1933 Report of the Subcommittee on Pipe Coatings and Corrosion.[1]† A specimen of each type of coating was cut in two with a hack saw, care being taken not to injure the coating. A wire was then soldered to the cut end of the pipe and the specimen suspended from it in a two-gallon crock containing salt water. The specimen was immersed to a depth of about 6 inches. A carbon rod in the salt water served as one electrode and the pipe as the other. The specimens remained in the salt water for about three years. The conductance of each coating was measured with appropriate instruments and electrical circuits at more or less regular intervals. Water was added to the crocks from time to time to replace that lost by evaporation.

Difficulty was experienced with some coatings because the lower end of the pipe could not be effectively sealed, especially where a porous shield covered the coating. By examining the specimens at the end of the test, it could be determined whether or not the seal over the end of the pipe had broken and it was usually possible to obtain the true value of the final conductance of the coating.

B. Soil Tests

The boxes used for making this test had internal dimensions of ten inches in each direction and had three-inch circular holes cut in the center of two opposite sides. A coated pipe specimen, 24 inches long was slipped through these two holes and was suspended in place at both ends from a strip of wood, resting on the top of the box, thus preventing injury to the coating by the sides of the box. Ten inches of the specimen was thus exposed to the action of the soil. Two dry cell carbons were

* Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

† All references appear at the end of this paper.

The paper, "Laboratory Studies of the Performance of Pipe Coatings" is being published as it is the desire of the Committee on Pipe Coatings and Corrosion to interest company members in the development to date in arriving at some satisfactory laboratory indication of the relative value of coatings.

Coincident with the field studies and examination of the buried samples, our Research Associate, Dr. Ewing, has been working for a number of years to develop a laboratory test that will be of assistance to the companies which have heretofore been compelled to purchase untried coatings without any slight indication of their practical usefulness. A considerable proportion of the time of our Research Associate this year will be devoted to trying out and perfecting all known methods of testing coatings in the laboratory. It is our hope that the company members will be sufficiently interested to bring to the attention of the chairman of the Pipe Coatings and Corrosion Committee, George H. Boyd, care of Consolidated Gas Company of New York, New York, N. Y., any pipe coating problems that they may have.

placed vertically in the box along the middle of the other two sides before the box was filled with dry and sifted soil. The soil chosen for the test showed some shrinkage, but it was not particularly corrosive at the beginning of the test. Water was added to each soil box at intervals of 7 to 14 days. At the time the test was started the soil had a resistivity of about 800 ohm cm. when saturated. After the test had been in progress for 18 months, salt water was added to each soil box so that the soil resistivity was reduced to about 200 ohm cm. This greatly increased the corrosiveness of the soil, so that a better idea of the protective value of the coatings could be obtained from an inspection of the pipes. The conductance of each coating was measured every day at the beginning of the test. The time between readings was gradually increased to several months at the end of the test. Figure 1 shows some of the coatings in the crocks containing salt water and some of the soil box tests.

The conductance was measured between the coated pipe and the two carbon rods in the box. The extremely wide range in the conductance of different coatings necessitated the use of several types of circuits, each circuit being best adapted for a certain conductance range. Most of the methods used in measuring the conductance have been described elsewhere and need not be repeated here.[2, 3]

At the end of the test, both the salt water and soil box specimens were carefully inspected, both before and after the coatings were removed. Pattern and conductance measurements, using the improved field methods, were also made on the soil box specimens.[4]

III. Results Obtained from Laboratory Tests

A. Salt Water Tests

A summary of the data from the salt water tests is given in Table 1. In it the coatings are arranged in decreasing order of final conductance. The symbols defining the coatings correspond with those given in previous descriptions of the A. G. A. coating tests.[1] If the final conductance measurement appeared to be faulty, because of the failure of the seal on the end of the pipe, the table shows a blank. General remarks on the nature of the conductance change and a very brief description of the condition of the pipe and coating is given in the table.

The most important conclusion to be drawn from the salt water test is that most of the asphalt coatings with organic reinforcements absorbed water, while most of the coal tar enamel coatings did not. This conclusion is based on the fact that the conductance of the former coatings increased gradually with time. On the other hand the conductance of the coal-tar enamel coatings, if it changed at all, did so in a series of more or less abrupt increases which probably were caused by breaks or cracks of some kind in the coatings. At the time the test was started, 22 of the 37 specimens had conductances so low that they appeared to be zero, while at the end of the test only three specimens had zero conductance.

It is evident from an inspection of the table that the final conductance is a reasonably good measure of the condition of the pipe under the coating, although there are exceptions as in the case of coatings M and D. The table shows that in general the condition of the pipes is better the lower the conductance. Coatings A and NT, which are two of the coatings that show zero conductance in this test, have failed in the field test in very heavy clay soils where soil stress is severe. From the field conductance measurements we find that coating A showed zero conductance in four locations, NT showed zero conductance in two places. Of the entire 587 specimens removed in the field, there were only eight other specimens which showed zero conductance. These facts indicate that moisture absorption alone is not a satisfactory criterion of the value of a coating. The field tests, however, are in good agreement with this test in that they both indicate that some coatings are practically moisture-proof.

The results of both this test and of the soil box test are in agreement with the conclusion reached by Scott (5) that if the coating conductance is below 0.04 millimhos (40 micromhos) per square foot, the pipe can be expected to be free from corrosion.

B. Soil Tests

1. *Conductance-time curves.*—The conductance-time curves of the coatings in the soil test differ in several respects from those of the salt water test. It is unnecessary to show all of the curves or to give the data from which they were obtained, since curves of similar coatings are somewhat similar and a few typical curves shown in Figure 2 will give the reader a sufficiently accurate picture of all of them. However, a very brief description of the form of the con-

Figure 1

Arrangement of salt crocks and soil boxes for laboratory coating tests

TABLE 1—SUMMARY OF DATA ON SALT WATER TESTS

Coating Symbol	*Initial Conductance (milli-mhos Per Sq.Ft.)*	*Final Conductance (milli-mhos Per Sq.Ft.)*	*Rank as Determined from Field Test*	*Nature of Conductance Change*	*Condition of Pipe (3) and Coating at End of Test*
C	1.73	855	37	Increased in jumps to a very high value.	Pitted 23 mils. Rusted everywhere. Coating swelled.
F	1150	833	25	Always very high. Decrease possibly due to filling of pores with ferrous hydroxide.	Pitted 37, 27, 52, 15 mils. Pipe wet and rusted.
K	6.02	667	39	Increased suddenly, then remained almost constant.	Deep pit at top of can. Otherwise unaffected.
FF	7.30	558	40	Increased suddenly to very high value, then decreased slightly.	No pits—metal attack and rust in many places.
G	0	556	42	Increased along smooth curve.	Pits 11, 12, 25. Material hard. Rust all over pipe.
VV	.00101	546	23	Increased along rather steep curve.	Pits 12, 19, 23. Fabric slightly rotted.
Q	.0109	424	29	Increased rapidly along smooth curve.	Faint rust stain—no rust. Fabric slightly rotted.
M	.00500	417	37	Increased suddenly, then slowly to very high value.	Metal attack in three places.
L	.00284	386	36	Increased rapidly from beginning.	Pits 35 and 41 mils. Faint rust stain over entire pipe.
LL	2.45	280	31	Increased very rapidly to very high value.	Rusted. Fabric strong. No bond between fabric and pipe.
DD	1.42	200	27	Increased very rapidly to very high value.	Metal attack 3 places. Most of pipe surface good.
EE	63.3	196	25	Increased very rapidly to very high value.	Pipe rusted. Material hardened. Bond ½ gone.
R	0	172	21	Very low until last few measurements.	Metal attack. Numerous cracks in coating. No distortion.
E	.038	106.0	33	Increased to large value in one month.	Pit 12 mils. Some metal attack. Material and bond good.
MM	0	64.5	22	Always high and irregular.	Rust on ⅛ pipe surface. Fabric strong.
NL	0	44.2	14	Increased rapidly from beginning.	Pipe rusted and covered with water.
VX	0	34.8	25	Increased rapidly from beginning.	Fabric rotted, no bond to primer, no rust.
V	0	26.00	20	Increased rapidly from beginning.	Metal attack two places. Pipe wet, no bond.
P	0	15.40	13	Increased rapidly from beginning.	Metal attack. Coating and pipe saturated. No bond.
W	0	12.00	10	0 until last few measurements.	Rusted at one point with moisture on pipe.
N	0	11.70	17	Increased rapidly from beginning.	Pipe rusted and moist—no bond.
D	.080	6.21	34	Moderately high with small rate of increase.	Pitted 19 mils. Metal attack several places.
H	.000475	5.72	28	Constant for year, then rapid increase.	Cracked with rust on coating surface.
B	0	1.06	29	Very low until last measurement.	One rusted place with moisture on pipe.
NS	0	.710	7	Began to increase at one month—gradual increase.	Shield corroded away. Rust over most of pipe surface.
X	.0001465	.370	11	About .001 milli-mho until last measurement.	Several rusted spots.
Z	0	.250	4	Very low until last measurement.	Two small rust spots, with moisture on pipe.
Y	0	.227	8	Gradual increase along smooth curve.	One sq.in. rusted with no bond.
WR	0	.191	31	Always very low.	Rust at one point. Shallow groove at water line.
WF	0	.00318	1	Always very low.	Pipe and coating perfect.
CC	0	.00005	2	Always very low.	Pipe and coating perfect.
NT	0	See note (1)	15	See note (1).	Pipe and coating perfect.
J	0	See note (1)	3	See note (1).	Pipe perfect—felt exposed in many places.
A	0	See note (1)	16	See note (1).	Pipe perfect—slight groove on coating at water line.
BB(2)	0	—	9	Began to increase at four months, gradual increase—moisture in can.	Coating and pipe perfect.
JJ(2)	0	—	5	Very low—failure in can last reading.	Two small rusted spots.
WL(2)	0	—	18	Almost zero for 18 months. Sudden increase—moisture found in can.	Pipe perfect—shallow groove in coating at water line.

(1) Measured conductances were not always zero, but they showed no trend or regularity and were always low, so they are believed to be due to leakage.
(2) Position of these coatings in order of merit is undetermined since true conductance is not known.
(3) Rust means "unmistakable accumulation of corrosion products which may be scraped off the pipe with knife blade."
Metal attack means "where rusting has progressed to the point of roughening the pipe surface to depth less than 10 mils."
Pitted means "metal attack has been measured and found to be at least 10 mils in depth." See Ref. (1), page 18, or report by Scott to this Conference, reference (4).

ductance-time curve for each coating is given in Table 2.

Curve 1 of Figure 2 is more or less typical of all of the asphalt emulsion coatings in the test. Most of the observed resistance of these specimens is not the resistance of the coating but the resistance of the soil between the pipe and the carbon rods in the box. The conductivity of the soil varies with its moisture content and the cycles in the curve are caused by the rapid wetting of the soil and its gradual drying. An increase in the conductance of many of the coatings after about 18 months, caused by the addition of salt water to the soil boxes, is not apparent for the coatings whose conductance curves are shown in Figure 2.

The curves for the thin cut back paints are similar to those for emulsions, except that the fluctuations are sometimes greater and the coatings sometimes have a lower initial conductance which soon increases to about the values shown for the emulsions.

The comparatively thin coatings with organic reinforcements usually have very low conductances at the beginning of the test. They absorb moisture rapidly so that after a month or less they are thoroughly saturated and behave about the same as emulsions and cutbacks.

Curve 2 in Figure 2 is a typical curve for a hard enamel coating which apparently had one or more cracks in it at the beginning of the test. The conductance is in general less than that of the previously described coatings and shows very wide fluctuations due to variations in moisture. The wide fluctuations are not caused by changes in the conductivity of the soil with wetting and drying. The coatings in which this effect is observed have considerable electrical resistance so that the resistance between pipe and carbon is mostly in the coating. When the soil is wet, the capillaries or cracks in the coating become filled with water and these capillaries carry most of the current. When the soil becomes dry, the water is drawn out of the capillaries and the conductance of the coating decreases to a small part, often only one-hundredth of its conductance when wet. At the end of the test, the conductance of this coating was about the same as it was at the beginning, if allowance is made for the effect of the salt water which was added to the soil boxes. One enamel coating had zero conductance throughout the test, indicating that its moisture absorption is practically zero. In addition to this enamel coating, two other coal-tar enamels which were reinforced with asbestos felts showed no measurable conductance throughout the test. Some enamel coatings that had no initial conductance suddenly developed a measurable conductance later. When these specimens were inspected, discontinuities in the coating could always be located with the pattern test. These discontinuities, rather than the absorption of moisture, account for the suddenly developed measurable conductance.

Curve 3 of Figure 2 is typical of the heavier coatings in the test which are reinforced with organic fabrics or felts. The bitumen in all but one of these coatings is asphalt. These curves do not show fluctuations in conductance. Most of the measured resistance of these specimens is in the coating itself and not in the surrounding soil. These coatings gradually and continually absorb moisture from the soil, usually for a period of about six months, when they become saturated and show no further increase in conductance.

2. *Condition of coatings at end of test period.*—The final condition of the coatings

TABLE 2.—SUMMARY OF DATA ON LABORATORY SOIL TEST

Coating Symbol	Final Conductances (milli-mhos Per Sq.Ft.) Field Method in Conjunction with Pattern Test	In Dry Soil	In Saturated Soil	In Salt Water	Description of Pattern	Rank of Patterns (1)	Inspection of Soil Box Specimens: Pipe Condition (2) a	b	c	d	e	Max. Pit.	Condition of Coating(3)	1933 Field Data: No. with Pattern	No. with Rust	No. with Metal Attack	No. with Pits	Rank from Field Data 1933 Report
Bare	117	54.3	1900	—	About one-third dense blue.		—	3	3	3	3	54		14	14	14	14	
Q	92	47.4	760	424	Large blue patches.	37	—	3	3	3	3	65	R	14	14	5	2	29
SS	74	0 ∝	543	—	Numerous large spots.	38	—	3	3	3	3	15	P	14	14	14	10	40
K	45.1	0 ∝	108.3	667	Numerous large spots.	36	—	3	3	3	0	0	P	14	14	14	10	39
G	37	15.15	190	556	Numerous large spots.	32	—	3	3	3	3	28	P, C	14	14	14	10	42
DD	26	3.03	84.3	200	Peculiar alligatored pattern.	30	—	3	3	3	0	0	P, R	7	6	2	0	27
V	25	19.9	108.3	26.0	About 15 small spots.	24	—	3	3	3	3	15	R, C, W	11	10	3	0	20
FF	20.9	27.1	83.3	588	Numerous small spots.	23	—	3	3	3	3	18	P, C	14	14	13	10	40
S	17.9	.773	25.2	—	Several large spots.	34	—	1	3	3	3	11	P	14	12	8	5	35
LL	17.9	9.50	49.9	280	About 20 large spots.	31	—	3	3	3	1	15	R, W	12	11	4	2	31
D	15.9	7.60	27.1	6.21	About 20 large spots.	33	—	3	3	0	0	0	P, R	11	4	3	2	34
EE	13.4	19.00	57.7	196	Two small dotted areas.	13	—	3	3	3	0	0	—	11	11	5	1	25
VV	12.5	13.75	35.8	546	About 15 small spots.	26	—	3	3	3	3	30	R, W, C	14	12	4	0	23
F	11.9	2.05	14.9	833	About 10 small spots.	19	—	3	3	3	0	0	P, C	13	9	3	2	25
E	9.0	2.71	17.2	106	8 large—few small spots.	22	—	3	3	3	3	27	C	13	13	13	6	33
P	8.13	6.31	14.8	15.4	Large stained area.	21	—	3	3	3	0	0	C, R, W	3	5	0	0	13
VX	7.40	3.04	15.4	34.8	About 20 small spots.	25	—	3	3	3	3	25	C, R	13	11	6	0	25
MM	6.60	3.44	10.43	64.5	Six large spots.	28	—	3	3	3	3	15	R, W	11	6	2	0	22
T	5.40	1.55	6.73	—	One spot—one stained area.	14	—	3	3	3	0	0	R, C, W	3	5	2	0	12
L	5.15	2.30	12.2	386	Ten small spots.	17	—	3	3	3	3	30	B	13	10	7	5	36
M	4.35	6.90	126.0	416	Numerous large and small spots.	35	—	3	3	3	3	23	B, P	14	12	11	6	37
WW	3.70	.076	.0632	—	One large abrasion—one small spot.	29	—	1	3	0	0	0	U	7	1	0	0	19
NT	3.14	.882	6.96	0	Few small faint dots.	9	—	1	3	3	1	10	C	4	5	1	0	15
NL	2.98	1.33	5.10	44.2	Two very faint dots.	8	—	1	3	0	0	0	C	3	3	0	0	14
R	2.82	.0279	1.26	172	Numerous lines (cracks).	27	—	1	3	—	—	—	C	6	7	1	0	21
A	2.34	.521	6.89	0	Three large linear spots.	20	—	1	3	3	3	14	C	2	2	1	0	16
WR	2.34	.140	2.42	.191	Several spots.	18	—	1	3	3	0	0	P	8	4	3	1	31
N	1.93	1.405	3.63	11.7	One very faint dot.	7	a	—	—	—	—	—	C	2	3	0	0	17
X	1.67	1.43	3.55	.37	Two large spots.	16	—	3	3	3	0	0	C, R, W	2	7	1	0	11
JJ	1.09	.588	1.26	9.35	Four faint spots.	12	—	3	3	3	1	20	U	0	1	0	0	5
BB	.96	.512	3.98	.885	One small dotted area.	10	—	1	2	1	0	0	U	0	2	0	0	9
Y	.90	.843	1.93	.227	One spot.	15	—	3	3	2	0	0	C, R, W	4	5	0	0	8
Z	.483	.157	1.58	.250	No pattern.	6	—	1	1	0	0	0	O	0	2	0	0	4
H	.155	.000728	.0626	5.72	Three small spots.	11	—	1	1	1	0	0	Bubble	12	8	5	2	28
NS	.0685	.0632	.079	.71	Almost covered with blue (4).		a	—	—	—	—	—	O	2	1	0	0	7
CC	.040	.0205	.0345	.00005	No pattern.	4	a	—	—	—	—	—	O	0	2	0	0	2
WL	.024	.00157	.557	.555	No pattern.	5	a	—	—	—	—	—	P	8	2	1	0	18
WF	.0103	.00061	.00112	.0031	No pattern.	3	a	—	—	—	—	—	O	0	0	0	0	1
J	.00037	.000047	.000063	0	No pattern.	2	a	—	—	—	—	—	O	0	0	0	0	3
W	00	.00002	.000063	12.0	No pattern.	1	a	—	—	—	—	—	O	4	0	0	0	10

(1) Rank of patterns is average of four individual rankings based on pattern density.
(2) Exact definitions of these symbols given in report of G. N. Scott to 1933 Distribution Conference[4] and in U. P. P. I. Code: a—unaffected, b—rusted (area), c—rusted (number of places), d—metal attack, e—pitted. The numbers refer to the extent of the observed effect and have the following general meaning: 1—slight, 2—moderate, 3—extensive.
(3) R—fabric rotted, P—soil penetration, C—bitumen cracked, W—moisture on pipe, B—blistered, U—undetermined, O—unaffected.
(4) Pattern test does not apply for this coating.

Coating Symbol	Shape of Conductance—Time Curve
Bare	Always high, moderate fluctuations, no trend.
Q	Always high, moderate fluctuations, no trend.
SS	Always high, moderate fluctuations, no trend.
K	Rapid initial increase, wide fluctuations.
G	Always high, moderate fluctuations, no trend.
DD	Low, increased rapidly first week, narrow fluctuations.
V	Low, increased to high value first month, narrow fluctuations.
FF	High with slight decrease, moderate fluctuations.
S	Zero at first, erratic increases, wide fluctuations.
LL	Low to high value first week, narrow fluctuations.
D	Zero, increasing to moderate value, smooth curve.
EE	Very high with moderate fluctuations, no trend.
VV	Low, rapid increase along smooth curve, to moderate value.
F	High, with slight decrease, moderate fluctuations.
E	High, with slight decrease, moderate fluctuations.
P	Zero, increasing to moderate value, smooth curve.
VX	Zero, increasing rapidly to steady value, narrow fluctuations.
MM	Zero, increasing to moderate value, smooth curve.
T	Zero, increasing slowly to moderate value, smooth.
L	Increases slowly from moderate value, smooth.
M	Moderate values, no trend, wide fluctuations.
WW	Zero for 18 months, increases suddenly to low value.
NT	Zero for six months, increases gradually "moderate."
NL	Zero increasing along smooth gradual curve.
R	Low, no trend, wide fluctuations.
A	Zero for nine months, increases suddenly to moderate value.
WR	Zero for seven months, increases suddenly to low value.
N	Zero for two weeks, increases gradually, smooth.
X	Zero for one month, increases gradually, smooth.
JJ	Zero for two weeks, increases rapidly along smooth curve.
BB	Zero for one month, increases gradually, smooth.
Y	Zero for two weeks, increases gradually, smooth.
Z	Zero for two weeks, increases slowly with one sudden jump.
H	Low values, wide fluctuations, no trend.
NS	Zero for four months, increases very slowly, always low.
CC	Zero for two months, very low, steady value thereafter.
WL	Zero for six months, increases suddenly, wide fluctuations.
WF	Always practically zero.
J	Always practically zero.
W	Always practically zero.

as indicated by conductance tests, pattern tests and condition of the pipe is given in Table 2. For purposes of comparison, data obtained from field inspections on the same coatings are also given.

The conductance data are given in columns 2 to 5. Column 2 shows the final conductance obtained by the improved field method.[3] Before removing the specimens from the box, the soil had been allowed to dry for six weeks. The values of conductance obtained in the dry soil are shown in column 3. The soil was then soaked for several days until the maximum possible values of conductance were obtained. These values are given in column 4. The values given in columns 3 and 4 have been corrected for the resistance of the soil between the pipe and the carbon rods.

Except for the coating WW, which was injured when the wood veneer was removed, the soil box conductances agree as well as could be expected with the pattern test measurements. The clay and water mixture

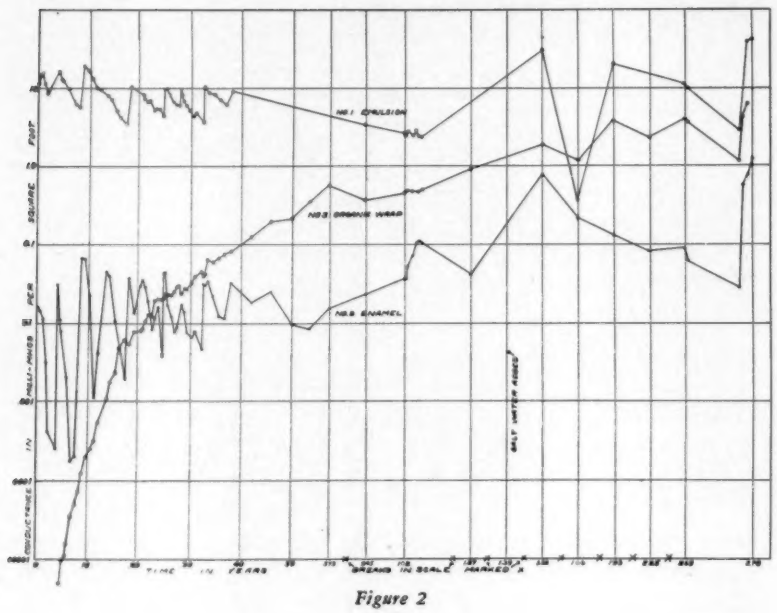


Figure 2

used in the pattern test measurements had a resistivity of about 1000 ohm cm. The resistivity of the soil in the boxes at the end of the test period was about 300 ohm cm. when saturated. The conductance of a coating obtained by the improved field method appears to be a reasonably good measure of the conductance of the coating in the soil, provided the resistivity of the clay and water mixture has about the same value as the resistivity of the soil in which the coating was buried.

As was observed in the salt water test, there is a general but not perfect correlation in the soil test between the coating conductance, the density of the pattern and the condition of the pipe. Considering the uncertainty in the arrangement of the patterns in order of increasing density, the uncertainty in deciding how much weight should be given to, say, general light rusting as compared with metal attack at a single point, and the inherent experimental errors that are associated with any corrosion experiment, the correlation between the pattern density and corrosion on the pipe is as definite as could be expected, so that pattern density is really a measure of the corrosion in this experiment. Some coatings which absorb moisture and thus have high conductances, do not necessarily show dense patterns. Except for coating NS, which has a steel shield, a positive pattern usually indicates some corrosion on the pipe. One very faint point on one pattern was not associated with any visible corrosion on the pipe and one small rusted spot was found under a coating which showed no pattern. These are the only exceptions.

IV. Discussion of Results

Certain very marked differences are evident from a comparison of the two laboratory tests with each other. The conductances are usually higher in the salt water, because the water has a very low resistivity. Notable exceptions, however, are coatings A and NT which are both zero in the salt water. These coatings are impermeable to water but they are sometimes not sufficiently strong mechanically. These same statements apply to several other coatings. The coatings which are reinforced with rag felts also usually have lower conductances in the salt water. These felts are badly rotted in the soil boxes but well preserved in the salt water. In the salt water bacterial action and soil stress are both absent, although in actual field conditions these effects are responsible for many coating failures.

It has already been pointed out that in the soil box test the pattern density appears to be a reasonably good measure of the corrosion on the pipe. A comparison of either the patterns or the conductance of the coatings in the laboratory soil test with the arrangement of the coatings in order of relative merit as determined from the field results (1) shows that in the laboratory soil test the rotting of the fabrics has progressed further than it has on the average in the field but that the mechanical effect of the soil on the coatings was not as marked as it was in the field. Hence the laboratory test as it was conducted penalized the organic reinforced coatings, which fail principally from the decomposition of the fabrics, while it makes the coal tar enamels appear relatively better than they have appeared in the field. This behavior of the test was noticed when the coatings were examined. The effect of soil stress was not as marked as it was in many of the field sites but the organic fabrics were in a more advanced stage of decomposition than they were in most field sites. The effect of the soil on the coatings corresponded more nearly to that of the Muck in the West Palm Beach site than to that of any other soil.

In all probability, most of the mechanical action of the soil occurred soon after the test was started. The decomposition of the fabrics could not start until they had become wet, and most of the rotting probably occurred during the later part of the test period. It is therefore possible that later field removals will yield data more in accord with the results of the laboratory test.

The reason for the discrepancy between the field and laboratory results is apparent from a consideration of the conditions under which the laboratory test was carried out. The rate of evaporation was rather low in the poorly ventilated room and the soil was not allowed to dry thoroughly before it was soaked again. Hence the temperature and moisture content were ideal for bacterial growth but the soil did not exert its maximum distorting action by shrinking and swelling through the entire moisture range.

V. Suggestions for Making Laboratory Coating Tests

A. Resistance to Soil Action

The laboratory soil test results have been shown to differ from the average field results in a very definite way. The reason for this difference is evident from the way the test was conducted. The way to modify the test to make it correspond more closely with the average field results is apparent. The soil test should be used as a comparatively short time test to determine the resistance of the coatings to soil distortion. The procedure used in these tests may be greatly simplified and all the necessary information may be obtained with very little expense or effort. The following is a suggested procedure for making this test.

Construct an outdoor box, treated with creosote oil to prevent rotting and with a reasonably tight bottom. The box should be arranged so that the sun and wind will dry the soil and so that it is protected from the rain. The clay should be as heavy as possible and should be thoroughly wetted and broken up at the beginning of the test. The addition of 0.2 per cent of sodium carbonate to the clay will help to break it up and puddle it so that it will be very hard and tough when it drys. The carbonate will make the soil practically non-corrosive, so corrosion on the pipe should not be used as a means of judging the value of the coatings. Coated pipe specimens would be placed in the box after the soil is wetted and mixed up. Coatings applied to panels could not possibly exhibit some of the types of failure which have been observed on pipes in the field. When the soil is completely dried out it should be thoroughly soaked again. Three or four wetting cycles, which would take two or three months in the summer will show whether or not the coatings are satisfactory from a mechanical standpoint in the soil chosen. The only

measurements that will be necessary are pattern conductance measurements on the specimens at the beginning and end of the test.

The box test is rather slow; it would require two or three months to carry out. But so long as its limitations are understood it is a valuable test and at this time is probably the best method available to determine the resistance of a coating to soil action. Any given test of this kind can be expected to give comparable results on a group of coatings and to show the relative merits of the coatings. But if one investigator in New England finds that a particular coating is satisfactory under the conditions of his test, it does not follow that the coating will prove satisfactory in a heavy clay soil in Texas.

B. Moisture Absorption

If the coating will not absorb moisture the organic fabrics in it cannot decompose, the bond to the pipe will not fail and blistering of the coating will not occur. The data from the soil box test indicate that the decomposition of the fabrics is closely related to the rate of water absorption as determined from the increase in conductance of the coating. Numerous arrangements for making moisture absorption tests have been proposed, the salt water test being one of them. The inherent faults of this particular test have been pointed out. While it is possible to carry out this test and obtain reliable results, it requires considerable careful watching to avoid leaks. Whenever a coating, applied to a pipe, is exposed to water, more or less difficulty will always be experienced in protecting the ends of the pipes. With many coatings the absorption of water will become apparent after a few days and a test period of one month should be sufficient to show the extent to which a coating will absorb moisture. It has become common practice to add salt to the water in these tests. The salt prevents the action of bacteria on the fabrics. The test would be more representative of conditions in most soils if ordinary tap water were used.

The two types of tests which have been described will give a reasonably accurate indication of what to expect from any bituminous coating in service. If the coating is to be used in a heavy clay soil or in cinders or rocky soil, its value will depend principally upon its ability to resist soil action. But if the coating is to be used in a wet mucky place, its resistance to water penetration is of greater importance. As the conditions of service vary from these extremes, the performance of the coating in both tests should be considered. With some types of coatings additional tests may be necessary, among which may be mentioned the tendency of the coating material to foam, thus leaving pinholes in the coating. The possibility of cracking at the time of, or soon after application, should also be considered. There are, numerous other considerations that enter into the choice of a coating which are beyond the scope of this paper.

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(2) Logan, K. H., Determining the Value of Pipe Coatings; Oil and Gas Journal, Vol. 27, no. 5, p. 33, May 2, 1929.
(3) Shepard, E. R., Measurement of the Electrical Conductance of Non-Metallic Pipe Coatings; American Gas Journal, June 1932.
(4) Scott, G. N., and Ewing, S. P., An Electrolytic Method for Determining the Condition of a Non-Metallic Pipe Coating; paper at 1933 Distribution Conference.
(5) Scott, G. N., Progress Report No. III, Second Inspection of Pipe Coating Tests on Operating Lines; A. P. I. Proceedings, 13th Meeting, p. 128, 1932.

CORRECTION

On page 64 of the February, 1934, issue of the A. G. A. MONTHLY, there was published a paper: "Production of Vapor-Phase Gum for Pilot Tests by Continuous Addition of NO to City Gas." This paper was prepared by W. D. McElroy, of the Physical Laboratory, United Gas Improvement Company, Philadelphia, Pa., under E. J. Brady's direction. The entire development represented the joint work of the Chemical and Physical Laboratories. The authorship was erroneously ascribed to J. A. Perry who has requested that proper credit be given as above. We would also call attention to an error made in the second paragraph on page 70, last line, where the word "grains" was used instead of "grams."—Ed.

George A. Lane, Authority on Meters, Passes Away

GEORGE A. LANE, former superintendent of the meter repair division, The People's Gas Light and Coke Company, Chicago, Ill., died February 11 at his home in that city. Mr. Lane, for years active in affairs of the American Gas Association, was sixty-five years old and retired from active work last July.

Mr. Lane was regarded as an authority on gas meters, and his work in this field earned for him recognition throughout the gas industry. After serving many years as a member, he was elected chairman of the Meter Committee, Technical Section, A. G. A., in 1924 and held that office through 1928. He was the author of various reports and papers and contributed frequently to the meter short course at Iowa State College. He won signal honor for his patents on certain types of meters, and won a wide reputation for his lectures on that subject before Middle West institutions.

Mr. Lane received his early education in the public schools of Chicago, supplemented with a business college course. When fourteen years old he became a plumber's helper. He began his gas company career with the old Hyde Park Gas Company, Chicago, in 1887, where he was meter reader, bill deliverer, service helper and eventually meter repairer. In 1922 he was appointed superintendent of the meter shop and three years later took full charge of the repair division.

McCarter Awards

John Perrotta

FOR saving the life of a fellow-workman, who had been overcome by gas, through application of the prone pressure method of resuscitation, two employees of the gas department, Green Mountain Power Corporation, Burlington, Vt., were awarded a Thomas N. McCarter Medal and Certificate by the American Gas Association.

The presentations were made by Ralph N. Hill, vice-president and general manager of the corporation, at a dinner and banquet. John Perrotta received a McCarter medal and certificate, while Michael Alberry was honored with a certificate. Mr. Perrotta discovered a workman in a roadway excavation when he was asphyxiated, and immediately began application of the prone pressure treatment. He later was assisted in the work of resuscitation by Mr. Alberry and together they succeeded in restoring normal breathing to the victim.

Michael Alberry

Besides Mr. Hill, John W. Sheehey, operating manager of the company, and J. P. McCann, of Worcester, Mass., director of safety of the New England Power Association, commended Messrs. Perrotta and Alberry.

Meter-Reading Record

TWENTY meter readers of the Consolidated Gas Company of New York and affiliated gas companies of the Metropolitan Area went through 1933 with perfect records of correct meter reading. A total of 1,324,442 meters were read without error by these men during the year.

Our successes we ascribe to ourselves; our failures to destiny.

TESTING LABORATORY

R. M. CONNER, Director Managing Committee: J. S. DeHART, Jr., Chairman N. T. SELLMAN, Secretary

High Flue Gas Temperatures Measured by Unique Method

ATTEMPTS so far successful are being made at the Laboratory to apply the "spectral-line-reversal method" to the precise measurement of flue gas temperatures in excess of those at which thermocouples (even of special types and materials) can reliably be used. This spectroscopic method of temperature measurement has long been employed, particularly by the United States Bureau of Mines, for the determination of flame temperatures; however, so far as is known, it has never been employed in the practical manner in which the Laboratory is adapting it to temperature analyses of extremely hot gases flowing at considerable rates.

In broad outline the procedure is as follows: Small quantities of finely divided sodium salts are introduced into the air-gas mixture prior to combustion, with the result that incandescent sodium vapor is present in the flue gases from the test furnace or tunnel. The monochromatic sodium light from this source, in addition to the light from a calibrated band lamp, is viewed through a spectroscope.

After adjusting the energy input to the calibrated band lamp until the sodium spectral lines appear, through the spectroscopic system, to be just reversing (just turning from light to dark) upon the continuous spectrum background, a measure of the temperature of the sodium vapor in the flue gases may be secured by noting the temperature of the band lamp filament with an optical pyrometer. Sufficient comparison of this method of flue gas temperature measurement with methods involving pyrometers, thermocouples, and heat balance studies, has been possible, in limited ranges, to inspire considerable confidence in its accuracy. However, absolute checks over wide gamuts of flue gas temperature have not yet been established.

This work is being undertaken in connection with Projects Nos. 26 and 27, new activities of the Committee on Industrial Gas Research of the American Gas Association, concerning respectively the effects of operating temperatures and furnace pressures on the combustion of city gas. Preliminary investigation relative to these subjects was conducted in conjunction with Project No. 20, "Research in the Fundamentals of Combustion Space Requirements in High Temperature Gas Furnaces," recently completed and reported in First Bulletin, Report No. 723. Significant fundamental information was revealed by that study. It is expected that progress in the two new fields will be as rapid and complete.

New Standards Proposed for Tubing and Automatic Devices

TENTATIVE Listing Requirements for (1) Semi-Rigid Gas Appliance Tubing and Fittings, and (2) Automatic Devices Designed to Prevent Escape of Unburned Gas, are now available in printed form and have been submitted to the industry for comment and criticism. Although both sets of proposed standards concern gas appliance appurtenances never heretofore covered, for general application, by A. G. A. Requirements, all specifications included are the result of extensive research and broad field experience.

The Subcommittees of the Approval Requirements Committee concerned with the drafting of these new requirements have taken into account the fact that listed accessories or materials may be used under any and all circumstances and, accordingly, have laid great stress upon safety and adaptability. Copies of these new proposed standards may be obtained by application to the American Gas Association, 420 Lexington Avenue, New York, N. Y.

The standards for semi-rigid gas appliance tubing and fittings specify strength, flexibility, endurance, durability, season cracking, and corrosion tests, which, if satisfactorily met, attest to the safety and serviceability of semi-rigid tubing and fittings when used on gas appliances or their accessories. Adequate resistance to corrosion by both sulphidation and oxidation is required of all tubing and fittings by limiting the permissible increase in weight of sample pieces which are subjected for two hours at 900° F. to streams of hydrogen sulphide or oxygen at given rates of flow. A special and more strict corrosion requirement must be met if the tubing to be tested is represented as suitable for use in heat zones where the temperature exceeds 350° F.

In the requirements covering automatic devices designed to prevent escape of unburned gas, important performance tests cover leakage, capacity, time of operation, pilot operating characteristics, continuance in the open position, and continued operation. Safety is even a more paramount consideration than usual in this set of standards inasmuch as the only function of the devices concerned is one of safety and, hence, great reliance is placed upon their satisfactory operation. The time required by a device to open or close the main gas supply is rigidly regulated, depending upon the type of service it is intended to give; and pilot flames must perform without the deposition of carbon or exhibiting tendencies to flash back. Other vital items involve life tests and where pilot burners are of complex types, the inter-relationships of different ports and flames.

These two new sets of proposed listing specifications fill out considerably the present series of listing standards of the Association. Similar requirements either exist or are in the final stages of approval relative to draft hoods, gas burner valves, gas pressure regulators, thermostats, water pressure, temperature and vacuum relief valves, automatic gas shut-off valves, diaphragm gas valves, electric gas-control valves, and conversion burners.

Changes Made in Requirements for Water Heaters

THE most extensive revisions in, and additions to, the Approval Requirements for Gas Water Heaters that have been made since the adoption of the original requirements were passed by the Subcommittee at its December meeting.

These proposed changes apply to the American Standard Approval Requirements for Gas Water Heaters (effective July 1, 1934) and, although they will not be completed and become effective until some time in 1935, attention is called to them at this time since they have just been distributed to the industry for criticism and comment.

Among the more important changes are the following:

(1) An increase in the minimum allowable thermal efficiency for all types of heaters; (2) an increase in the minimum allowable service or over-all efficiency of storage water heaters; (3) the addition of a requirement making mandatory the use of means of relief for both excessive stored water temperatures and pressures; and (4) the correlation of the construction and performance specifications for thermostats, gas valves, automatic relief and shut-off valves, and draft hoods contained in the water heater requirements, with the listing requirements for such accessories.

Monthly Summary of Gas Company Statistics

FOR MONTH OF DECEMBER, 1933

Issued January, 1934, by the Statistical Department of the American Gas Association
420 Lexington Avenue, New York, N. Y.

PAUL RYAN, Statistician

COMPARATIVE DATA ON THE MANUFACTURED AND NATURAL GAS INDUSTRY FOR THE MONTH OF DECEMBER

	Month of December			Twelve Months Ending December 31		
	1933	1932	Per cent Change	1933	1932	Per cent Change
Customers						
Domestic (Including House Heating)	14,539,600	14,539,200	0.0			
Industrial and Commercial	963,300	961,700	+ 0.2	*See December*		
Total	15,502,900	15,500,900	0.0			
Revenue (Dollars)						
Domestic (Including House Heating)	46,542,300	49,799,000	— 6.5	493,894,300	531,335,800	— 7.0
Industrial and Commercial	17,655,100	17,742,500	— 0.5	188,236,900	192,925,500	— 2.4
Total	64,197,400	67,541,500	— 5.0	682,131,200	724,261,300	— 5.8

COMPARATIVE DATA ON THE MANUFACTURED GAS INDUSTRY FOR THE MONTH OF DECEMBER

Customers						
Domestic	9,385,400	9,445,000	— 0.6			
House Heating	79,900	62,500	+27.8			
Industrial and Commercial	484,800	485,900	— 0.2	*See December*		
Miscellaneous	8,700	8,100	—			
Total	9,958,800	10,001,500	— 0.4			
Gas Sales (MCF)						
Domestic	20,651,100	21,641,200	— 4.6	247,929,200	267,281,500	— 7.2
House Heating	4,095,100	3,243,900	+26.2	23,197,600	21,640,100	+ 7.2
Industrial and Commercial	7,149,000	6,737,300	+ 6.1	81,535,400	81,270,800	+ 0.3
Miscellaneous	181,300	201,400	—	1,877,100	2,015,700	—
Total	32,076,500	31,823,800	+ 0.8	354,539,300	372,208,100	— 4.7
Revenue (Dollars)						
Domestic	24,481,500	25,801,800	— 5.1	296,047,900	322,051,700	— 8.1
House Heating	2,422,400	2,212,800	+ 9.5	15,340,800	15,965,100	— 3.9
Industrial and Commercial	5,788,400	5,989,700	— 3.4	67,143,700	72,339,500	— 7.2
Miscellaneous	113,500	129,800	—	1,309,000	1,394,000	—
Total	32,805,800	34,134,100	— 3.9	379,841,400	411,750,300	— 7.7

COMPARATIVE DATA ON THE NATURAL GAS INDUSTRY FOR THE MONTH OF DECEMBER

Customers						
Domestic (Including House Heating)	5,074,300	5,031,700	+ 0.8			
Commercial	446,900	445,000	+ 0.4			
Industrial	16,200	16,100	+ 0.6	*See December*		
Main Line Industrial	5,000	5,000	0.0			
Miscellaneous	1,700	1,600	—			
Total	5,544,100	5,499,400	+ 0.8			
Gas Sales (MCF)						
Domestic (Including House Heating)	30,727,300	35,325,000	—13.0	259,804,900	276,644,000	— 6.1
Commercial	8,679,800	10,671,400	—18.7	83,521,800	87,185,000	— 4.2
Industrial	35,570,600	30,301,700	+17.4	366,237,300	345,121,900	+ 6.1
Main Line Industrial	12,172,100	11,201,600	+ 8.7	129,409,800	111,016,900	+16.6
Miscellaneous	1,304,100	1,216,100	—	9,678,500	9,927,200	—
Total	88,454,100	88,715,800	— 0.3	848,652,300	829,895,000	+ 2.3
Revenue (Dollars)						
Domestic (Including House Heating)	19,638,400	21,784,400	— 9.9	182,505,600	193,319,000	— 5.6
Commercial	3,877,300	4,505,800	—13.9	37,988,300	40,087,000	— 5.2
Industrial	6,359,500	5,677,800	+12.0	66,466,300	64,889,800	+ 2.4
Main Line Industrial	1,327,000	1,271,700	+ 4.3	13,744,700	12,704,300	+ 8.2
Miscellaneous	189,400	167,700	—	1,584,900	1,510,900	—
Total	31,391,600	33,407,400	— 6.0	302,289,800	312,511,000	— 3.3

Gas Revenues Decline 5.8 Per Cent in 1933

REVENUES of manufactured and natural gas utilities in the United States during 1933 aggregated $682,131,200, a decrease of 5.8 per cent from the 1932 figure.

The manufactured gas companies reported revenues of $379,841,400 for the year, or 7.7 per cent less than for the preceding year, while revenues of the natural gas utilities aggregated $302,289,800, a decline of 3.3 per cent.

Sales of manufactured gas reported for 1933 totalled 354,539,300,000 cubic feet, a loss of 4.7 per cent, while natural gas sales were 848,652,300,000 cubic feet, representing an increase of 2.3 per cent over 1932.

Sales of gas for domestic purposes of both manufactured and natural gas companies ran about 6 per cent under the figures for 1932, although the number of domestic customers was substantially unchanged at the end of the year.

Sales of manufactured gas for house heating purposes, however, registered a gain of 7.2 per cent for the year. Sales for industrial-commercial purposes, however, were practically unchanged.

Sales of natural gas to ordinary industrial consumers increased 6 per cent during 1933, while sales to large scale industrial users were up nearly 17 per cent.

The amount of natural gas used for non-utility purposes including manufacture of carbon black and consumed in oil and gas field operations apparently was the same as for 1932, with the result that the entire consumption of natural gas for all purposes during 1933 is expected to run about 1 per cent above the corresponding figure for 1932.

Gas Exhibit at Farm Show Ties in with A. G. A. Sales Promotion Work

(Continued from page 80)

transacted was nearly $400,000; meals were served to more than 80,000 people, 30,000 in the main cafeteria, and 50,000 at the lunch counters. The total gas used was more than 300,000 cu.ft., considerably in excess of former years.

Included among the exhibits were attractive displays of electrical equipment, oil burners, gasoline stoves, bottled gas, etc., and for the first time it was conceded that the gas exhibit was the outstanding one of the show.

The traveling laboratory of the Pennsylvania State Health Department, in which an Electrolux gas refrigerator is part of the equipment, was on the exhibit floor.

Now just a brief description of the Farm Show Building.

It covers an area of 9.67 acres on a plot of ground of 46.2 acres, located about a mile from the business district of Harrisburg. It is fully equipped with heat, light and power, gas and water. The main structure is one story high, and the entire building is fireproof, of steel, concrete and brick construction.

The main building contains 344,000 square feet of floor area, 75 per cent of which can be used for commercial and agricultural exhibit purposes.

On the mezzanine floor is a kitchen, and a dining room with a seating capacity of 700. The kitchen is equipped with modern gas-burning appliances, which cost $12,000, including two No. 8 Ruud instantaneous and one No. 4 Ruud instantaneous heaters which supply abundant hot water to the kitchen and washroom. Gas supplies emergency heating to a number of the offices and gas igniters are used in the large coal burning furnaces.

Balance Sheet Consolidation by Machine

(Continued from page 93)

more, the prompt inter-change of inter-company accounts receivable statements at the end of the month will help each company make sure that the schedules supporting the balance sheet are correct when first submitted.

All eliminating entries should be made in the form of a journal entry and should be headed with the consolidation number and entry number. They may then be sent to the machines for posting in the usual manner.

Proof sheets of the postings should be returned to the auditing department with the entries, and should be checked in the same manner as the tallies of balance sheet postings.

Conclusion

It will be apparent after a trial that consolidating balance sheets by machine is an economical method of doing this work. Furthermore, by using unit ledgers for each consolidation the utmost in flexibility can be attained. If new consolidations appear in the picture, or companies shift from one group to another, a new ledger may be added or a number or two may be changed. Thereafter the work will proceed with practically no instructions to the machine operators.

Another valuable feature of the system is that the consolidation work proceeds as rapidly as individual balance sheets are ready for posting. There is no need to wait for all the balance sheets of a group. The machine takes its work in any order and keeps it up to the minute.

New Member

THE American Gas Association has welcomed into membership the United American Bosch Corporation, Springfield, Mass., which company has recently taken over the Kompak Company of New Brunswick, New Jersey, and will continue to manufacture its line of gas water heaters. R. W. Washburn, secretary of the company, is the official delegate.

Proceedings Available

PROCEEDINGS of the National Association of Railroad and Utilities Commissioners at its annual convention in Cincinnati, Ohio, October 10-13, 1933, are off the press and ready for distribution. Information may be had from James B. Walker, secretary of the association, 270 Madison Avenue, New York, N. Y.

Industrial Sales Council To Meet April 20

THE next meeting of the Midwest Industrial Gas Sales Council will be held at the Palmer House, Chicago, April 20.

Cost of Water Heating by Furnace Coils

(Continued from page 90)

a heating coil in the fire box. The results obtained from the test follow:

	Coil in Furnace	
	Connected	*Disconnected*
Average daily inside temperature	68-70° F.	67-70° F.
Average daily outside temperature	31.1	31.1
Date of beginning test	Jan. 21	Feb. 22
Date of completing test	Feb. 19	Mar. 14
Number of days in test	30 days	21 days
Total pounds of coal used	3,642	2,184
Average pounds of coal per day	121.4	104."

In this case the saving in fuel, where the furnace coil is not used, is 16.7%.

I believe that the foregoing evidence is sufficient to prove that in a general way the placing of a furnace coil in a house heating furnace will add approximately 20% to the consumption of fuel in that furnace.

Associations Affiliated with A. G. A.

Canadian Gas Association
Pres.—Donald G. Munroe, Montreal Coke & Mfg. Co., Montreal, Que.
Sec.-Tr.—G. W. Allen, 21 Astley Avenue, Toronto.

Empire State Gas and Electric Association
Pres.—Alfred H. Schoellkopf, Niagara Hudson Power Corp., Buffalo, N. Y.
Chairman, Gas Section—A. M. Beebee, Rochester Gas & Electric Corp., Rochester, N. Y.
Sec.—C. H. B. Chapin, Grand Central Terminal, New York, N. Y.

Illinois Public Utilities Association
Pres.—Bernard J. Mullaney, The Peoples Gas Light & Coke Company, Chicago, Ill.
Sec.—J. R. Blackhall, Suite 1213, 79 West Monroe St., Chicago, Ill.

Indiana Gas Association
Pres.—R. S. Brunner, Indiana Gas Utilities Co., Richmond, Ind.
Sec.-Tr.—P. A. McLeod, New Castle, Ind.

Michigan Gas Association
Pres.—Walter E. White, Commonwealth & Southern Corp., Jackson, Mich.
Sec.-Tr.—A. G. Schroeder, Grand Rapids Gas Light Co., Grand Rapids, Mich.

Maryland Utilities Association
Pres.—F. A. Mitchell, Eastern Shore Public Service Co., Salisbury, Md.
Sec.—D. E. Kinnear, 803 Court Square Bldg., Baltimore, Md.

Mid-West Gas Association
Pres.—R. L. Klar, Des Moines Gas Co., Des Moines, Iowa.
Sec.-Tr.—Roy B. Searing, Sioux City Gas & Electric Co., Sioux City, Iowa.

Missouri Association of Public Utilities
Pres.—Fred Karr, St. Joseph Gas Co., St. Joseph, Mo.
Sec.-Tr.—N. R. Beagle, Missouri Power & Light Co., Jefferson City, Mo.
Asst. Sec.—Jesse Blythe, 103 West High St., Jefferson City, Mo.

New England Gas Association
Pres.—F. M. Goodwin, Boston Consolidated Gas Co., Boston, Mass.

Exec. Sec.—Clark Belden, 41 Mt. Vernon St., Boston, Mass.

Chairman, Operating Div.—P. R. Buchanan, Hartford Gas Co., Hartford, Conn.

Sec.-Tr., Operating Div.—D. R. Campbell, Portland Gas Light Co., Portland, Me.

Chairman, Sales Div.—H. B. Hall, Old Colony Gas Co., East Braintree, Mass.

Sec.-Tr., Sales Div.—R. J. Rutherford, Cambridge Gas Light Co., Cambridge, Mass.

Chairman, Industrial Div.—P. A. Nelles, Charles H. Tenney & Co., Boston, Mass.

Sec.-Tr., Industrial Div.—S. F. Morgan, New Bedford Gas & Edison Lt. Co., New Bedford, Mass.

Chairman, Accounting Div.—Leland Balch, Lowell Gas Light Co., Lowell, Mass.

Sec.-Tr., Accounting Div.—C. D. Perkins, Malden & Melrose Gas Light Co., Malden, Mass.

Chairman, Manufacturers Div.—C. H. Cummings, Industrial Appliance Co. of N. E., Boston, Mass.

Sec.-Tr., Manufacturers Div.—J. H. McPherson, James B. Clow & Sons, Boston, Mass.

New Jersey Gas Association
Pres.—F. A. Lydecker, Public Service Electric and Gas Co., Newark, N. J.

Sec.-Tr.—G. B. Webber, Public Service Electric and Gas Co., Newark, N. J.

Ohio Gas and Oil Men's Association
Pres.—L. K. Langdon, Union Gas & Electric Co., Cincinnati, Ohio.
Sec.-Tr.—Wm. H. Thompson, 811 First National Bank Bldg., Columbus, Ohio.

Oklahoma Utilities Association
Pres.—R. J. Benzel, Southwestern Bell Telephone Co., Oklahoma City, Okla.
Mgr.—E. F. McKay, 1020 Petroleum Bldg., Oklahoma City, Okla.

Pacific Coast Gas Association
Pres.—Geo. P. Egleston, H. R. Basford Co., San Francisco, Calif.
Mang. Dir.—Clifford Johnstone, 447 Sutter St., San Francisco, Calif.

Pennsylvania Gas Association
Pres.—A. J. Llewellyn, Luzerne County Gas & Electric Corp., Luzerne, Pa.
Sec.—Frank W. Lesley, Pennsylvania Gas & Electric Co., York, Pa.

Pennsylvania Natural Gas Men's Association
Pres.—F. F. Schauer, Equitable Gas Co., Pittsburgh, Pa.
Sec.-Tr.—B. H. Smyers, Jr., 435 Sixth Ave., Pittsburgh, Pa.

Southern Gas Association
Pres.—B. B. Ferguson, Portsmouth Gas Co., Portsmouth, Va.
Sec.-Tr.—S. L. Drumm, New Orleans Public Service Inc., New Orleans, La.

The Public Utilities Association of Virginia
Pres.—T. Justin Moore, Va. Elec. & Power Co., Richmond, Va.

Wisconsin Utilities Association
Pres.—R. G. Walter, Wisconsin Power & Light Co., Madison, Wis.
Exec. Sec.—J. N. Cadby, 135 West Wells St., Milwaukee, Wis.

16th Annual Convention and Exhibition
American Gas Association
◆
Atlantic City, N. J.
Week of
October 29, 1934

Personnel Service

SERVICES OFFERED

Manager. Thoroughly experienced in gas, natural gas and electric operation. Excellent record in New Business and in handling difficult properties. 812.

Executive and **sales** position. Thoroughly experienced gas utilization engineer, industrial house heating and domestic, nine years' experience in new business operations. 815.

Controller, executive assistant, general **accountant,** charge of finances; twenty years' experience general and cost accounting; preparation and administration of budget; control of departmental operations; interim and annual statements; charts, graphs; supervision accounting department, personnel, correspondence, collections, adjustments; office management; purchasing; unemployment due to liquidation of firm; salary moderate; (46) married. 816.

Market analyst (33) has recently completed supervision of house heating survey for gas company in large mid-western city, while employed by well-known concern of marketing counsellors. A highly successful campaign was executed and domestic sales increased sharply on basis of house heating study. Background includes practical engineering and marketing experience in other basic industries. 817.

As **superintendent** or **manager** of gas property by man having a number of years' experience in all branches of the gas business. Capable of taking charge of any plant, either coal, water or natural gas. 818.

Executive **manager,** University man. Eighteen years' experience in the industry. Experience covers all phases of the business on coal, water and coke oven gas operations. Particularly successful with sales development on coke, house heating and refrigeration. Excellent public relations and employee personal record. Married. 819.

Utilities **accountant-engineer;** twelve years' experience, uniform system of accounts, original cost valuation of land, structures and equipment in operating property, fixed capital analyses and records, depreciation and retirement reserve, financial and operating reports, cost accounting, rate investigations; graduate engineer (39). 822.

Distribution engineer, technical graduate, married, six years' experience with manufactured and natural gas. Can survey, design, make extensions or modernize low and high pressure systems. A practical **operator,** can handle men, utilization problems, and installation of appliances. Position wanted as **superintendent** or staff assistant. 823.

Manufacturer's representative. Particularly desirous of carrying complete line of automatic gas-fired water heaters and tank heaters. Well known among gas companies, plumbing supply jobbers, plumbers and architects in New York City, Westchester County and Long Island, and has excellent contacts, having covered this trade for the past fourteen years. 824.

Combustion engineer with ten years' experience in plant fuel economy desires connection with utility or industrial concern. A thorough knowledge of and practice in fuel application to industrial operations. Six months foreign consulting. Chief consideration to effect fuel economy. Salary secondary to opportune connection. 826.

Manufacturer's distributor: Gas ranges and appliances; New York and Eastern territory. Wide experience in sales, sales administration and manufacturing plus valuable contacts among utilities, leading department, furniture and house furnishing stores, stove jobbers and dealers, coupled with successful record, is advertisers' background. Strictly commission basis. 827.

SERVICES OFFERED

Noise reduction and elimination of vibration are special problems for mechanical engineers. For the past two years I have been specializing in this work. Back of this lies eighteen years' practical engineering experience divided between gas and steel industries since graduating as M.E. 828.

Sales-gas engineer desires utility operating connection or as manufacturers' sales representative; graduate engineer, twenty years' diversified experience, familiar with design, construction and operation of all gas equipment including holders from drafting board to erection; knows their maintenance and operation thoroughly. Exceptional sales record and unusually fine contacts. 829.

Executive—Not "Jack-of-all-trades"—but one having thorough training, broad experience as Secretary, Treasurer, General Manager, Sales-Advertising-Publicity Manager, Security Sales Director, Cost Analyst, Rate-Valuation Engineer, Industrial Power-Gas Engineer, and otherwise highly developed all phases public utility work; successful record; invaluable contacts. 830.

Gas engineer with manufactured or natural gas company or gas consulting engineering firm. Wide experience in production and distribution work also design and construction of natural gas distribution systems. Some experience in valuation work and securing of franchises. Married (35); willing to go anywhere. 831.

Sales supervisor, new-business man, buyer, desires position. Broad education. Understands public, dealer relations. Thorough knowledge domestic appliances, home service, gas cooking schools, range style shows. Original ideas for meeting electric competition, holding old, obtaining new business. Proven ability to operate with minimum stocks, get frequent turnover and increase sendout. 832.

Operating manager—engineering graduate with consulting and operating experience in natural and manufactured gas; production, transmission and distribution. Age 42, married. Familiar with accounting and experienced in financing. Recently had complete executive responsibility for operating group of natural gas properties. Immediately available. 833.

Executive-engineer (41) N. Y. State Engineer license, member A.S.M.E. Available for investigations, reports, rate studies, valuations, promotional work, organization of construction and operating forces or general executive assignment. Many years' successful utility experience with both independent and syndicate properties. 834.

Engineer, broad experience, industrial design, consulting, supervising, executive, plant construction, development product, air and gas compressors, gas engines, design, development, application, sales, automatic gas-fired forced air equipment, services open by the case or definite connection considered. 835.

Sales engineer capable of managing house heating department in all its branches, covering surveys, installation, estimates, sales promotion, service, repairs and maintenance. Experience also covers industrial field with regard to high and low pressure boilers and large volume water heating. Broad general and technical experience. 836.

Graduate **gas engineer** (29) with five years' experience in engineering, development and operation of carburetted water gas and coal gas plants, gas transmission and high and low pressure distribution systems; market studies, rates and valuations. Trained for and experienced in utility management. 837.

Accounting, cost-general, eight years' experience as cost accountant compiling cost data covering utility operations and construction, such as: gas plants, booster stations, manufactured and natural gas transmission and distribution systems. Have audited field office records (payrolls, petty cash funds and material accounts) and compiled special accounting—statistical reports. 838.

SERVICES OFFERED

Gas engineer, B.S. in Chemical Engineering; five years of rounded experience in the United States and abroad. Have had practical and technical experience in plant, distribution, office, construction and survey. Desire executive position with small company. Will go anywhere. Married (29). 839.

Technical manager, superintendent or engineer, with broad experience of twenty years, covering manufactured gas, natural gas transmission, reforming, blending, change-over, high and low pressure distribution and lay-out. Familiar with brushing up sluggish activity or run down properties of holding company. Sales service and utilization; aggressive. 840.

POSITIONS OPEN

Gas appliance **salesmen** wanted. Those having utility sales experience preferred. We have an attractive proposition for men who can show a clean, successful record. Our product is outstanding in its field. Straight commission. No drawing account. Contracts for 1934 now being made. Desirable openings available in eastern and southern states. 0265.

Gas appliance salesmen, with utility sales experience preferred and with sound knowledge of gas combustion. State in confidence, your age; sales experience; length of employment with former employers; products sold; chief territory covered, and upon what basis of remuneration. Our product is well known and advertised. Have desirable openings for result-getters upon drawing account against commission basis. 0266.

Foreman or **engineer** wanted for Roumania, expert in erecting and running natural gas channel black plant. Applicants should have had several years' practical experience; please give record and state salary expected. 0267.

TWO MORE LETTERS

From executive of important equipment manufacturer, January 18:

"Thank you very much for your letter of the thirteenth and the list of available men. I am returning all of them except the application of Mr. ————, Key ——, as I have written Mr. ——— to call. * * * *"

The applicant referred to visited headquarters two weeks later, thanked us for our services and said he had just been selected for a responsible position.

From president of another large organization, February 13:

"I am returning all but three of the papers enclosed in your kind letter of February 9 and wish to thank you for your courtesy * * * * would appreciate it very much if you would ask these men to call and see me as soon as convenient."

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